Encl. 2

Brief Academic Research Profile of Prof. Anil Kumar

1. **Name and address** Dr. Anil Kumar, **FRSC, FNASc**
   (Ex-Professor, Dept. of Chemistry, *Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, INDIA)*
   Present Affiliation: Adjunct Faculty, Applied Department of Chemistry, Delhi Technological University, Bawana Road, Delhi.

2. **Email(s) Address:** anil.kumar@cy.iitr.ac.in; akmshfcy@gmail.com

3. **Academic Administrative Experience:**

- **Professor & Head**, Department of Chemistry (May 2013 to February 2016)
  Indian Institute of Technology Roorkee, Roorkee-247667, Uttarakhand, INDIA.

- **Founder Head,** Centre of Excellence - **Nanotechnology** (June 2006 to Dec. 2011),
  Indian Institute of Technology Roorkee, Roorkee-247667, Uttarakhand, INDIA.

4. **Academic Achievements**

Professional Recognition/ Award/ Prize/ National Academy / Society Fellowship received:

A-a. Professional Recognition

S No	Professional Recognition/National Academy/Society Fellowships	Year
1.	**Lifetime Achievement Recognition** given by ***Indian Society for Radiation and Photochemical Sciences***, ***BARC, Mumbai*** in the area of ***Photochemistry***, especially for ***Nanomaterials Related Research*** during *Trombay Symposium on Radiation and Photochemistry-2024, Mumbai.*	**2024**
2.	**Selected NASI-Senior Scientist Platinum Jubilee Fellow** *The National Academy of Sciences, Allahabad, India*	**2019**
3.	**Fellow** of *Royal Society of Chemistry* ***(FRSC)***	**2018**
4.	**Elected Fellow,** *The National Academy of Sciences* ***(FNASc)****, Allahabad, India*	**2003**
5.	**Elected Member** American Chemical Society	**1982**

b. Other Awards/Prizes/Fellowships

S. No.	Awards/Recognition	Year
1.	**Professor Emeritus,** Netaji Subhas Univ. of Technology, New Delhi	**2022-2024 (~1 Year)**

	Professor (Emeritus Fellow), Indian Institute of Technology Roorkee, Roorkee	**2019 –2022**
2.	**G.B. Pant Institute Chair Professor,** Indian Institute of Technology Roorkee, Roorkee	**2018 –2021**
3.	**Bharat Vikas Award – 2017** For outstanding performance in the field of ***"Development of Nanostructured Materials"***, Institute of Self Reliance**,** Bhubaneshwar, Odisha.	**2017**
4.	**Selected for Higher Administrative Grade (HAG) scale by** IIT Roorkee, Roorkee	**2013**
5.	Received **Certificate of Appreciation** by **American Chemical Society, USA** for valuable contribution and dedicated service in the Peer Review of manuscripts submitted to ACS Journals.	**2011, 2024**
6.	**Star Performer** Selected for **Academic and Professional Excellence,** Indian Institute of Technology Roorkee, Roorkee	**2003-04 and 2004-05**
7.	**First Khosla Research Prize and a Medal** on a Research Paper on "Electronic properties of Q-CdS clusters stabilized by adenine" I.I.T. Roorkee.	**2002**
8.	**Khosla Research Award and a Silver Medal** on a Research Paper, "Photoluminescence of colloidal cadmium sulfide in the presence of aniline - study of the CdS – sensistized photocatalytic reaction"**,** Univ. of Roorkee.	**1993**
9.	**Guest Scientist** Hahn-Meitner-Institut, Berlin, **Germany**	**Feb. 1986 - Feb. 1988 (~2 Years)**
10.	**CSIR Pool Officer**	**April 1982- June 1983**
11.	**Research Associate** **Radiation Laboratory,** **Univ. of Notre Dame**, Notre Dame, Indiana –46556, **USA**	**1979 - 1982 (~3 Years)**
12a.	**CSIR Postdoctoral Fellow**	**1978-79**
12b.	**Received CSIR** *(New Delhi)* **Fellowship**s throughout research career in India as **JRF**	**1973-77**
13.	**Received Gold Medal** and a **Certificate** Being Topper in M.Sc., S.D. College, Muzaffarnagar (Meerut University)	**1973**

(B). Recognitions

- **Ph.D. Thesis *Supervision*:** "*In situ Synthesis of Heteroatom(s) (N/S/P) Co-doped Porous Reduced Graphene Oxide as Electrode Material(s) for Designing of Binder-free and High-mass loaded Sustainable High Performance Aqueous Symmetric Supercapacitor and*

Electrochemical Sensor" *by* ***Ikrar Ahmad*** *is adjudged an Outstanding* ***Ph.D. work in Science Stream*** *under the category of Fundamental Research. It fetched him the* ***"Excellence in Doctoral Research Award"*** **from** ***IIT Roorkee.***

- Based on our research paper: *I. Ahmad* and **Anil Kumar** *"In-situ synthesis of N, S co-doped electrode material by an environmentally benign method towards designing of high voltage (3.0 V) binder-free sustainable aqueous symmetric supercapacitor*", in *Chem. Engg. J., 477, 146972 (1-16) (2023), I. Ahmad* has been awarded *Prof. V.K. Gupta Memorial Impactful Young Researcher Award* vide letter dated ***May 08, 2024.***

- *International Popular Scientist Award* ***"Best Researcher Award"*** for the ***Contribution and Honourable Achievement in Innovative Research*** by ScienceFather, ***8th Dec. 2023***.

- ***Member of International Scientific Committee,*** *Trombay Symposium on Radiation and Photochemistry-2022, and* ***Chaired a Session in this Prestigious Conference*** *on 12th January 2022.*

- **Our innovation** on **"*Nitrogen doped Reduced Graphene Oxide (N-rGO) for High-Performance Supercapacitor"*** contributed by ***Anil Kumar*** *and Sahil Thareja has been* ***identified*** *by the prestigious* ***Confederation of Indian Industry (CII)*** *among the* ***notable innovations from IIT Roorkee during 2021***.

- **Ph.D. Thesis *Supervision*:** *"Synthesis of N-Doped Reduced Graphene Oxide and its Nanohybrids as Electrode Material(S) for Electrochemical Applications – An Analysis of the Role of different Aqueous Electrolytes on their Supercapacitive Performance" by* ***Sahil Thareja****, fetched him* ***INYAS National Research Excellence Award 2021*** *and among the* ***Best Thesis in Electrochemistry.***

- **Reviewer** for reputed journals from ACS, RSC. Elsevier, Wiley and Springer. Reviewed Scientific Projects from **SERB/DST**, **CSIR** and **UGC**.

- **Nominated** by the **Institute to SERB, New Delhi** for the **award of National Science Chair (2021).**

- **Delivered an Invited Lecture** as a ***Resource Person*** in the Orientation Program ***to B.Tech 1st year Students (Freshers)*** as per ***MHRD Guidelines*** at NIT Kurukshetra on ***"Role of Basic Sciences to The Development of Advanced Technology"*** on 9th August 2019.

- The paper, entitled *"High Performance Symmetric Supercapacitor based on Nitrogen doped Reduced Graphene Oxide"* by Sahil Thareja and **Anil Kumar**, presented by Sahil Thareja won the ***Best Poster Award*** in DAE-BRNS sponsored conference on Electrochemistry in Industry, Health and Environment-2020 ***(EIHE-2020)***held during *21-25th January 2020, BARC, Mumbai, India*.

- Invited for several conferences abroad and in India as an **Invited Speaker** / **Organizing Committee Member.**

- The paper, entitled *"Synthesis of Glucose-Mediated Ag-γ- Fe_2O_3 Multifunctional Nanocomposites – A Study of their Catalytic and Antibacterial Activities"*by Mandeep Kaloti, **Anil Kumar** and N.K. Navani, presented by ***Mandeep Kaloti*** won the Second-Best ***Poster Award*** in International Conference *on Advanced Materials for Energy, Environment and Health* (ICAM-2016) held during *04-07th March 2016*, IIT Roorkee, Roorkee, India.

- Our paper, entitled *"Viscoelastic Properties of Superparamagnetic 5'-Adenosine Monophosphate-Mediated Porous β–FeOOH Hydrogel – Its Loading, and Release Capabilities"* by **Anil Kumar** and Sudhir K. Gupta and presented by Sudhir K. Gupta, won the ***Best Poster Award*** in 9th India Japan Bilateral Conference ***(BICON-2014)*** on Advanced Material Science and Engineering.

- **Honorable Guest**, 2nd International Conference & Exhibition on Materials Science and Engineering, October 07-09, ***2013, Las Vegas, USA***.

- **Expert,** Annual Review Committee, Radiation and Photochemistry Division, ***BARC***, Mumbai, **March 2012** and **June 2008.**

- **Member,** Expert Committee, ***CSIR*** (SRF/RA) during **2024**, **2018** & **2008-10**.

- Two of our research papers on 'Nanotechnology Aspects' have been listed/selected under the **most accessed papers** in the first quarter in ***'Langmuir' (2007)*** and ***'Nanotechnology' (2009).***

- '***Synthesis of Fe_2O_3/Ag Core Shell Nanocomposites'*** by **Anil Kumar** and Aditi Singhal and presented by Ms. Aditi Singhal, won the *Second Best Poster Prize* in "Nanomaterials and Devices Processing and Applications" ***(NADPA 2008)***.

- **Member,** DST (New Delhi), National Management Committee for the National Centre for Ultrafast Processes, Univ. of Madras during ***1999-2003***.

(C). **Professional Activities**:

- **Elected Member**, American Chemical Society **(ACS)**, USA (1982); **Member** (2007 onwards contd.).
- **Fellow,** Royal Society of Chemistry (RSC), UK, 2018 onwards
- **Member**, Mirror Committee on Nanotechnology, Bureau of Indian Standards, New Delhi, 2007 - 2014.
- **Member**, **Sigma Xi,** the Scientific Research Society, USA (1981).
- **Life Member**, Indian Society for Radiation and Photochemical Sciences **(ISRAPS)**, Mumbai (1999).
- **Elected Member**, Life Member, Indian Chemical Society, Kolkata **(**F-3802).
- **Life Member**, Chemical Research Society of India, Bangalore.
- **Life Member**, Indian Association of Solid-State Chemists and Allied Scientists **(ISCAS).**

9. Teaching & Research Experience***(Please see parts A to J)***

Areas of Academic Interest*:*

Molecular Spectroscopy, Kinetics and Photochemistry, Radiation Chemistry, Nanoscale

materials, Chemical Thermodynamics, Surface Chemistry and General Physical Chemistry.

Research Interest

Nanotechnology *– Synthesis of colloidal metal and semiconductors, and carbonaceous nanomaterials employing greener protocols; Study of their Physicochemical Properties and Energy related Applications. Kinetic analysis of early events in: thermal, photochemical and radiation-induced reactions, specifically in nonmaterial(s).*

(A). ***Teaching Experience*** *(Approx. in years)*

Undergraduate	41
Postgraduate	42

We have made several ***innovative contributions to the teaching and research*** in the areas related to Physical Chemistry. In particular, we have developed teaching curriculum on ***kinetics, photo-*** *and* ***radiation chemistry, spectroscopy, nanoscale materials, supramolecular chemistry, thermodynamics, surface chemistry*** *and* ***undergraduate physical chemistry,*** *and* ***have been instrumental in developing several advanced research facilities*** at the institute as a ***faculty*** as well as being the **Founder Head,** ***Centre of Excellence – Nanotechnology*** and **Head,** ***Department of Chemistry****.*

(B) Research Publications in Journals / Presented in Conferences:

Total number of Publications in SCI Journals: 104
Refereed Journals– Total 104 in SCI Journals [**ACS** 22 (02 in **JACS**); **RSC** 24; **Elsevier** 20; **Wiley** 06; **IOP** 03; **Springer** 04; **Taylor & Francis** 01; **Indian Journals** 08; **Others** 16]

Total Citations as per Google Scholar Data (***Excluding Self-Citations***) (Approx.): 2505 (~2100***)*****; h-index** 27**; i10-index** 68. Citations during last 05 years since 2020 (as per Google Scholar data) ~ 698; **h-index** 16**; i10-index** 23.

Some Highlights of our Research Work

- We have taken several ***research initiatives*** at IIT Roorkee (erstwhile UOR). Some of these also got recognition globally as is reflected by ***citations*** (approx.) of our ***papers*** in: different books ***(35)***; important international journals such as: *Angew. Chem. /Nature – including Scientific Reports and Nature Nanotechnology* ***(12)***; *ACS* ***(>165)***; *RSC* ***(>130)***; Elsevier/Springer/Wiley ***(>600)***; and other journals as well as thesis ***(600)***, excluding *self-citations as per Google record*.

- Most of our research work, contributed in India after joining faculty position, is ***primarily carried out*** at UOR/IITR and has authorship(s) with my students (largely with 2 authors).

- Many of our Ph.D. students, willing to visit abroad, got ***fellowship(s)*** in good institutions and after returning back several of them are occupying good ***teaching/scientific*** positions. My first student has held/holding ***key position(s)*** in ***pharma/chemical*** industries.

- Since last 20 years, we have mainly focused on ***greener*** approach nanotechnology to ***design new biocompatible materials*** for their ***multifunctional applications***. Our recent ***publications*** and ***research projects*** (ongoing/completed) also reflect these ***objectives***. During about last 5.5 years, *i.e.,* from ***(2018 to present),*** we have published about 17 papers in ***International***

Journals** of repute* with an ***average impact factor of ~ ***6***, which indicates the **importance of our work in the context of current scientific importance.**

(C). List of Research Papers Published in the Area of Nanotechnology/Nanochemistry

(Note: *Since 1985 we are mainly working on **Nanomaterials** related to **Energy Applications** and publishing this work in fairly high impact journals with an **average impact factor of >6**).*

Total Paper Published in this Area –75 Nos.

S. No.	Details of Published Research Paper	Q Ranking of Journal as per SJR (2021)	Impact Factor (2022-23)
1.	I. Ahmad and **Anil Kumar** Heteroatom(s) (N, S, P) Co-doped Reduced Graphene Oxide-based Binder-free Novel Energy Storage Electrode Material for High Energy Density Supercapacitor. **Adv. Sustain. Syst.,** DOI:10.1002/adsu.202400174 **(2024).**	Q1**(1.393)**	**7.21**
2.	I. Ahmad and **Anil Kumar** In -situ synthesis of N, S co-doped electrode material by an environmentally benign method towards designing of high voltage (3.0 V) binder-free sustainable aqueous symmetric supercapacitor. **Chem. Engg. J., 477, 146972 (1-16) (2023).** **https://doi.org/10.1016/j.cej.2023.146972**	Q1**(2.8)**	**15.1**
3.	Atul Kumar, **Anil Kumar, *** G.D Varma Flexible humidity-tolerant γ-Fe_2O_3-rGO-based nanohybrids for energy efficient selective NO_2 gas sensing. ***New J. Chem.*** 47 (NJ047010), 4871-4879 **(2023).**	Q1**(0.69)**	**3.925**
4.	S. Thareja and **Anil Kumar** One-pot *In-situ* Synthesis of Mn_3O_4/N-rGO Nanohybrids for the Fabrication of High Cell Voltage Aqueous Symmetric Supercapacitor – An Analysis of Redox Activity of Mn_3O_4 Towards Stabilizing the High Potential Window in Salt-In-Water and Water-In-Salt Electrolytes **Energy & Fuels, 36 (24), 15177-15187 (2022).**	Q1**(0.822)**	**4.654**
5.	Atul Kumar, H Joshi, **Anil Kumar** Arsenate Removal from the Groundwater Employing Maghemite Nanoparticles **Water 14 (22), 3617 (2022).**	Q1**(0.72)**	**3.53**
6.	I. Ahmad and **Anil Kumar** Nucleotide(s)-mediated simultaneous N, P co-doped reduced graphene oxide (N, P-rGO) porous nanohybrids as a high-performance electrode material for designing sustainable binder-free high-voltage (2.8 V) aqueous symmetric supercapacitor and electrochemical sensor. **Sustain. Energy Fuels, 6, 4169-4182 (2022).**	Q1**(1.42)**	**6.813**
7.	S. Thareja and **Anil Kumar** *In-situ* Wet Synthesis of N-ZnO/N-rGO Nanohybrids as Electrode Material for high performance supercapacitor and simultaneous non-enzymatic electrochemical sensing of ascorbic acid, dopamine and uric acid at their interface.	Q1**(1.1)**	**4.177**

	J. Phys. Chem. C, 125, 24837-24848 (2021).		
8.	Atul Kumar, **Anil Kumar** and G.D Varma Ultrafast resistive type γ-Fe_2O_3-rGO nanohybrids based humidity sensor – a respiratory monitoring tool. **J. Mater. Chem. C, 9, 8002–8010 (2021).**	Q1**(1.608)**	**6.4**
9.	S. Thareja and **Anil Kumar** Water-in-salt' electrolyte based high voltage (2.7 V) sustainable symmetric supercapacitor with superb electrochemical performance - an analysis of the role of electrolytic ions in extending the cell voltage. **ACS Sustainable Chem. Eng. 9, 2338-2347 (2021).**	Q1**(1.743)**	**9.224**
10.	Priyanka and **Anil Kumar** Smart soft supramolecular hybrid hydrogels modulated by Zn^{2+} / Ag NPs with unique multifunctional properties and applications. **Dalton Trans., 49, 15095–15108 (2020).**	Q1**(0.86)**	**4.569**
11.	Priyanka and **Anil Kumar** Multistimulus-Responsive Supramolecular Hydrogels Derived by *in situ* Coating of Ag Nanoparticles on 5'-CMP-Capped β-FeOOH Binary Nanohybrids with Multifunctional Features and Applications. **ACS Omega 5, 13672-13684 (2020).**	Q1**(0.708)**	**4.132**
12.	Ajay Kumar, H. Joshi and **Anil Kumar** Remediation of Arsenic by Metal/ Metal Oxide Based Nanocomposites/ Nanohybrids: Contamination Scenario in Groundwater, Practical Challenges, and Future Perspectives. **Separation and Purification Rev. 1-31, (2020); DOI: 10.1080/15422119.2020.1744649**	Q1**(0.97)**	**7.889**
13.	Sahil Thareja and **Anil Kumar** High Electrochemical Performance of 2.5 V Aqueous Symmetric Supercapacitor based on Nitrogen doped Reduced Graphene Oxide. **Energy Technol.** (Wiley) **1901339 (1 to 11) (2020);*(DOI: 10.1002/ente.201901339).***	Q2**(0.83)**	**4.149**
14.	**Anil Kumar** and Priyanka Environmentally benign pH-responsive cytidine-5'-monophosphate molecule-mediated akaganeite (5'-CMP-β-FeOOH) soft supramolecular hydrogels induced by the puckering of ribose sugar with efficient loading/release capabilities. ***New J. Chem.** 43*, 14997-15013**(2019).**	Q1**(0.69)**	**3.925**
15.	Komal Gupta and **Anil Kumar** Zn^{2+}/Cd^{2+}-RNA-mediated Intense White-light-emitting Colloidal CdSe Nanostructures in Aqueous Medium – Enhanced Photophysics and Porous Morphology Induced by Conformational Change in RNA. ***J. Mater. Chem. C**, 7,* **692-708 (2019).**	Q1**(1.608)**	**8.067**
16.	**Anil Kumar** and Komal Gupta Supramolecular Assisted RNA-Templated Fluorescing Colloidal CdSe QDs Organized in Porous Morphology in the Presence of 1,3-Diaminopropane – Study of their Multifunctional Behavior **J. Phys. Chem. C *122,*7898−7915 (2018).**	Q1**(1.1)**	**4.177**

17.	M. Kaloti and **Anil Kumar** Sustainable Catalytic Activity of Ag-Coated Chitosan-Capped Fe_2O_3 Superparamagnetic Binary Nanohybrids (Ag--Fe_2O_3@CS) for the Reduction of Environmentally Hazardous Dyes - A Kinetic Study of the Operating Mechanism Analyzing Methyl Orange Reduction **ACS Omega, *3* (2), 1529–1545 (2018).**	Q1**(0.708)**	**4.132**
18.	M. Khandelwal and **Anil Kumar** **"**Electrochemical behavior of glycine mediated N-doped reduced graphene oxide" **New J. Chem., *41,* 8333-8340 (2017).**	Q1**(0.69)**	**3.925**
19.	**Anil Kumar** and Komal Gupta RNA-mediated fluorescent colloidal CdSe nanostructures in aqueous medium - analysis of Cd^{2+} induced folding of RNA associated with morphological transformation (0D to 1D), change in photophysics and selective Hg^{2+} sensing. **J. Mater. Chem. (A), *5,* 6146-6163 (2017).**	Q1**(3.099)**	**14.511**
20.	S. Firdoz and **Anil Kumar** ZnO nanoparticles and their acarbose-capped nanohybrids as inhibitors for human salivary amylase. ***IET Nanobiotechnol.*, 11 (3), 329-335 (2017).** **doi: 10.1049/iet-nbt.2016.0115**	Q3**(0.39)**	**2.050**
21.	M. Kaloti and **Anil Kumar** Synthesis of Chitosan-Mediated Silver Coated γ-Fe_2O_3 (Ag-γ-Fe_2O_3@Cs)Superparamagnetic Binary Nanohybrids for Multifunctional Applications **J. Phys. Chem. C *120,* 17627-17644 (2016).**	Q1**(1.1)**	**4.177**
22.	M. Khandelwal and **Anil Kumar** One-pot environmental friendly amino acid mediated synthesis of N-doped graphene-silver nanocomposites with enhanced multifunctional behavior **Dalton Trans., *45,* 5180-5195 (2016).**	Q1**(0.86)**	**4.569**
23.	M. Khandelwal and **Anil Kumar** One-step chemically controlled wet synthesis of graphene nanoribbons from graphene oxide for high performance supercapacitor applications **J. Mater. Chem. (A), *3,* 22975-22988 (2015).**	Q1**(3.099)**	**14.511**
24.	M. Kaloti, **Anil Kumar** and N.K. Navani Synthesis of glucose-mediated Ag - γ-Fe_2O_3 multifunctional nanocomposites in aqueous medium - a kinetic analysis of their catalytic activity for 4-nitrophenol reduction. **Green Chem. *17,* 4786-4799 (2015).**	Q1**(1.94)**	**11.034**
25.	Umesh Kumar Gaur, **Anil Kumar** and G D Varma Fe-induced morphological transformation of 1-D CuO nanochains to porous nanofibers with enhanced optical, magnetic and ferroelectric properties. **J. Mater. Chem. C, *3,* 4297- 4307 (2015).**	Q1**(1.608)**	**8.067**

26.	**Anil Kumar,** B. Singh and K. Gupta Photophysical aspects of varying Zn^{2+}/ PbSe nanostructures mediated by RNA leading to the formation of honeycomb-like novel porous morphology. **J. Phys. Chem. (C), *119,* 6314-6323 (2015)**.	Q1**(1.1)**	**4.177**
27.	**Anil Kumar** and S. K. Gupta Supramolecular–directed novel superparamagnetic 5'-adenosine monophosphate templated β-FeOOH hydrogel with enhanced multi-functional properties. **Green Chem., *17,* 2524–2537 (2015).**	Q1**(1.94)**	**11.034**
28.	**Anil Kumar** and M. Khandelwal A novel synthesis of ultra thin graphene sheets for energy storage applications using malonic acid as a reducing agent. **J. Mater. Chem. (A), *2,* 20345–20357 (2014).**	Q1**(3.099)**	**14.511**
29.	**Anil Kumar** and S.K. Gupta 5'-guanosine monophosphate mediated biocompatible porous hydrogel of β-FeOOH - Viscoelastic behavior, loading and release capabilities of freeze dried gel. **J. Phys. Chem. (B), *118,* 10543-10551 (2014)**.	Q1**(0.8)**	**3.466**
30.	**Anil Kumar** and V. Kumar Biotemplated inorganic nanostructures: Supramolecular directed nanosystems of semiconductor(s)/metal(s) mediated by nucleic acids and their properties. **Chem. Rev. (ACS), *114,* 7044-7078 (2014).**	Q1 **(18.718)**	**72.087**
31.	**Anil Kumar** and M. Khandelwal Amino acid mediated functionalization and reduction of graphene oxide – synthesis and theformation mechanism of nitrogen-doped graphene**.** **New J. Chem., *38,* 3457-3467 (2014).**	Q1**(0.69)**	**3.925**
32.	U. K. Gaur, **Anil Kumar** and G. D. Varma The synthesis of self-assembled 1-D CuO nanochains in aqueous medium and a study of their multifunctional features. **CrystEngComm (RSC), *16,* 3005–3014 (2014).**	Q2**(0.640)**	**3.756**
33.	**Anil Kumar** and S.K. Gupta Synthesis of 5'-GMP-mediated porous hydrogel containing β - FeOOH nanostructures: optimization of its morphology, optical and magnetic properties. **J. Mater. Chem. (B), *1,* 5818-5830 (2013).**	Q1**(1.215)**	**7.571**
34.	**Anil Kumar** and B. Singh Optoelectronic properties of dual emitting RNA mediated colloidal PbSe nanostructures. **Dalton Trans., *42,* 11455–11464 (2013)**.	Q1**(0.86)**	**4.569**
35.	**Anil Kumar** and S.K. Gupta Synthesis of adenine mediated superparamagnetic colloidal β-FeOOH Nanostructure(s) – study of their morphological changes and magnetic behavior. **J. Nanopart. Res. 15:1466, 1-16 (2013) (DOI 10.1007/s11051-013-1466-z).**	Q2**(0.42)**	**2.5**

36.	**Anil Kumar** and B. Singh Zn^{2+} induced folding of RNA to produce honeycomb like RNA - mediated fluorescing Zn^{2+}/PbSe nanostructures. **J. Phys. Chem. (C), *117,* 5386–5396 (2013).**	Q1**(1.1)**	**4.177**
37.	**Anil Kumar,** V. Chaudhary and Vinit Kumar Synthesis of guanosine 5′-monophosphate (GMP) - mediated Ag/CdS nanohybrids – their self-assembly and optoelectronic properties. **Eur. J. Inorg. Chem. 269-279 (2013).**	Q2**(0.55)**	**2.551**
38.	**Anil Kumar** and B. Singh RNA templated water soluble Mg^{2+}/ PbSe porous nanostructures with dual Fuorescence. **RSC Advances, *2,* 9079–9090 (2012).**	Q2**(0.667)**	**4.036**
39.	**Anil Kumar** and B. Singh Synthesis and photophysics of red emitting RNA templated PbSe nanostructures. **Chem. Commun., *47 (14)*, 4144 - 4146 (2011).**	Q1**(1.513)**	**6.065**
40.	**Anil Kumar** and A. Singhal Optical, photophysical and magnetic behavior of GMP-templated binary (β - Fe_2O_3/CdS) and ternary (β-Fe_2O_3/Ag/CdS) nanohybrids. **J. Mater. Chem., *21,* 481-496 (2011).**	Not assigned	**6.101 (Old)**
41.	**Anil Kumar** and A. Singhal Optical and magnetic behavior of Ag encapsulated β -Fe_2O_3 core-shell hollow Nanotubes. **Mater. Chem. Phys. *131,* 230-240 (2011).**	Q2 **(0.75)**	**4.778**
42.	S. Firdoz, Ma Fang, XiuliYue, Zhifei Dai, **Anil Kumar**, Jiangbin A novel amperometric biosensor based on single walled carbon nanotubes with acetylcholine esterase for the detection of carbaryl pesticide in water. **Talanta, *83,* 269 - 273 (2010).**	Q1 **(0.98)**	**6.1**
43.	**Anil Kumar** and V. Kumar Synthesis and optical properties of Guanosine 5′-monophosphate - mediated CdS nanostructures: An analysis of their structure, morphology and electronic properties. **Inorg. Chem., *48,* 11032-11038 (2009).**	Q1 **(1.12)**	**5.436**
44.	**Anil Kumar,** A. Jakhmola and V. Chaudhary Synthesis and photophysics of colloidal ZnS/PbS/ZnS nanocomposites - an analysis of dynamics of charge carriers. **J. Photochem. Photobiol. A: Chem. *208,* 195-202 (2009).**	Q1**(0.71)**	**5.141**
45.	**Anil Kumar** and V. Kumar Supramolecular – directed synthesis of RNA-mediated CdS/ZnS nanotubes. **Chem. Commun., 5433-5435 (2009).**	Q1**(1.513)**	**6.065**

46.	**Anil Kumar** and A. Singhal Synthesis of colloidal silver iron oxide nanoparticles – study of their optical and magnetic behavior. **Nanotechnology, *20,* 295606-295616 (2009).**	Q1**(0.757)**	**3.953**
47.	**Anil Kumar** and A. Jakhmola RNA-templated fluorescent Zn/PbS (PbS + Zn^{2+}) supernanostructures. **J. Phys. Chem. (C), *113,* 9553-9559 (2009).**	Q1**(1.1)**	**4.177**
48.	**Anil Kumar** and V. Chaudhary Time resolved emission studies of Ag-adenine-templated CdS (Ag/CdS) nanohybrids. **Nanotechnology, *20,* 095703 - 095712 (2009).**	Q1**(0.757)**	**3.953**
49.	**Anil Kumar** and V. Kumar Self-assemblies from RNA-templated colloidal CdS nanostructures. **J. Phys. Chem. (C), *112,* 3633-3640 (2008).**	Q1**(1.1)**	**4.177**
50.	**Anil Kumar** and A. Singhal Synthesis of colloidal β-Fe_2O_3 nanostructures - influence of addition of Co^{2+} on their morphology and magnetic behavior. **Nanotechnology, *18,* 475703-475710 (2007).**	Q1**(0.757)**	**3.953**
51.	**Anil Kumar** and V. Chaudhary Optical and photophysical properties of Ag/CdS nanocomposites – an analysis of relaxation of charge carries. **J. Photochem. Photobiol. A: Chem. *189,* 272-279 (2007).**	Q2**(0.63)**	**5.141**
52.	**Anil Kumar** and A. Jakhmola RNA – mediated fluorescent Q-PbS nanoparticles. **Langmuir (Lett.) 23, 2915-2918 (2007).**	Q1**(0.884)**	**4.331**
53.	**Anil Kumar** and N. Mathur Photocatalytic degradation of aniline at the interface of TiO_2 suspensions containing carbonate ions. **J. Colloid Interface Sci. *300,* 244-252 (2006).**	Q1**(1.4)**	**9.965**
54.	**Anil Kumar** and A. Jakhmola Photophysics and charge dynamics of Q-PbS based mixed ZnS/PbS and PbS/ZnS semiconductor nanoparticles. **J. Colloid Interface Sci. *297,* 607-617 (2006).**	Q1**(1.4)**	**9.965**
55.	**Anil Kumar** Physicochemical and photochemical properties of nanoscale semiconductors - dynamics of the charge carriers. **Natl. Acad. Sci. Lett., *28,* 1-11 (2005). (Published as a Lead Article)**	**Q3(0.2)**	**1.1**
56.	**Anil Kumar** and N. Mathur Photocatalytic oxidation of aniline using Ag^{+}-loaded TiO_2 suspensions. **Appl. Catal. A: Gen. 275,189-197 (2004).**	Q1**(1.08)**	**5.5**

57.	**Anil Kumar** and S. Mital Electronic and photocatalytic properties of purine(s)-capped Q-CdS nanoparticles in the presence of tryptophol. **J. Mol. Catal. A: Chem. *219*, 65-71 (2004).**	Q1**(1.072)**	**5.062 (old)**
58.	**Anil Kumar** and S. Mital Synthesis and photophysics of 6-dimethylaminopurine-capped Q-CdS nanoparticles – astudy of its photocatalytic behavior. **Int. J. Photoenerg. *6(2)*, 61-68 (2004).**	**Q2(0.407)**	**2.535**
59.	**Anil Kumar** and S. Mital Photophysics and photocatalytic behavior of composite CdS-purine nanoparticles in the presence of certain indoles. **J. Colloid Interface Sci. *265*, 432-438 (2003).**	Q1**(1.4)**	**9.965**
60.	**Anil Kumar** and A.K. Jain Photophysics and photocatalytic properties of Ag^+ - doped composite (CdS-TiO_2) colloidal semiconductor. **J. Photochem. Photobiol. A: Chem. *156*, 207-218 (2003).**	Q2**(0.68)**	**5.141**
61.	**Anil Kumar** and S. Mital Synthesis and photophysics of purine-capped Q-CdSnanocrystallites. **Photochem. Photobiol. Sci. *1*, 737-741 (2002).**	Q2 **(0.74)**	**4.328**
62.	**Anil Kumar** and S. Mital Electronic properties of Q-CdS clusters stabilized by adenine. **J. Colloid Interface Sci. *240*, 459-466 (2001).**	Q1**(1.4)**	**9.965**
63.	**Anil Kumar** and D.P.S. Negi Photophysics and photocatalytic properties of $Cd(OH)_2$ -coated Q-CdS clusters in the presence of guanine and related compounds. **J. Colloid Interface Sci. *238*, 310-317 (2001).**	Q1**(1.4)**	**9.965**
64.	**Anil Kumar** and A. K. Jain Photophysics and photochemistry of colloidal CdS-TiO_2 coupled semiconductors - Photocatalytic oxidation of indole. **J. Mol. Catal. A: Chem. *165*, 267-275 (2001).**	Q1**(1.072)**	**5.06 (old)**
65.	**Anil Kumar** and D.P.S. Negi Photocatalytic and photophysical behaviours of $Cd(OH)_2$ - coated Q-CdS in the presence of tryptophan. **J. Photochem. Photobiol. A: Chem., *134*, 199-207 (2000).**	Q2**(0.68)**	**5.141**
66.	**Anil Kumar** and A. Kumari Photocatalytic oxidative C-C bond cleavage of 1,2-ethanediol initiated by aqueous titanium dioxide dispersion - influence of Ag^+ on the catalytic activity. **Res. Chem. Intermed., *25*, 695-708 (1999).**	Q2**(0.45)**	**3.134**
67.	**Anil Kumar** and S. Kumar Colloidal CdS induced photocatalytic reaction of 2-methylindole - mechanistic analysis of oxidation of indoles. **J. Phys. Org. Chem. *11*, 277-282 (1998).**	Q3**(0.34)**	**2.155**

68.	**Anil Kumar,** S. Kumar and D.P.S. Negi Photocatalytic oxidative C-C bond cleavage of the pyrrole ring in 3-methylindole induced by colloidal CdS particles. **J. Chem. Res. (S), *1,* 54-55 (1998).**	Q4**(0.17)**	**1.4 RSC Journal (Old)**
69.	**Anil Kumar** and S. Kumar Catalytic effect of Ag^{+} in colloidal CdS- induced photooxidation of aniline. **Chem. Lett. (8), 711-712 (1996).**	Q2**(0.42)**	**1.715**
70.	**Anil Kumar** and S. Kumar Enhancement of luminescence of CdS in presence of indoles - study of CdS - sensitized reaction of indole. **J. Photochem. Photobiol. A: Chem., *83,* 251-256 (1994).**	Q2**(0.68)**	**5.141**
71.	**Anil Kumar** and S. Kumar Photoluminescence of colloidal cadmium sulfide in the presence of aniline - study of the CdS - sensistizedphotocataytic reaction. **J. Photochem. Photobiol. A: Chem. 69, 91-95 (1992).**	Q2**(0.68)**	**5.141**
72.	**Anil Kumar** Photoinduced processes in colloidal semiconductors – physicochemical properties and applications. **Bull. Indian Soc. Rad. and Photochem. Sci. *3(1),* 2-5 (1992).**	-	**-**
73.	**Anil Kumar,** A. Henglein and H. Weller Photochemistry and radiation chemistry of semiconductor colloids - preparation of colloidal PbO_2 and various electron transfer processes. **J. Phys. Chem. *93,* 2262-2266 (1989).**	NA	**ACS Journal (Old)**
74.	**Anil Kumar,** E. Janata and A. Henglein Photochemistry of colloidal semiconductors - quenching of CdS fluorescence by excess positive holes. **J. Phys. Chem. *92,* 2587-2591 (1988).**	NA	**ACS Journal (Old)**
75.	A. Henglein, **Anil Kumar,** E. Janata and H. Weller Photochemistry and radiation chemistry of semiconductor colloids - reaction of the hydrated electron with CdS and non-linear optical effects. **Chem. Phys. Lett. *132*, 133-136 (1986).**	Q2**(0.46)**	**2.719**

(D). Patents: Patent granted: **04**

S.No.	**Title**
(i).	**Anil Kumar** and Ikrar Ahmad "A One-Pot Synthesis Method of Heteroatom(s)-Doped Porous Reduced Graphene Oxide as Electrode Material by the Reduction of Graphene Oxide for the Fabrication of High Voltage Aqueous Symmetric Supercapacitor" ***(Granted* - *Indian Patent No.*** 520307 **granted on 5th March 2024.** (Indian Patent A***pplication no. 202211072704 dated 15th Dec. 2022.)***

(ii).	Atul Kumar, **Anil Kumar** and G.D. Varma An Ultrafast Resistive Type Humidity Sensor Based on Nanohybrids *Granted* **- *Indian Patent No. 488912 granted on 26th Dec. 2023.*** ***(Indian Patent application no. 202011007304*** dated**. 20/02/2020).**
(iii).	**Anil Kumar** and Sahil Thareja A Method for Synthesis of Nitrogen-Doped Reduced Graphene Oxide (N-rGO) for High Performance Supercapacitor Granted **- *Indian patent No. 391742 granted on 11th March 2022 (Indian Patent Application No.201811031021).***
(iv).	Himanshu Joshi, **Anil Kumar,** Ajay Kumar Synthesis of iron oxide nanohybrids (maghemite phase) employing raw spent wash from distillery industry as a precursor material." *Granted* **- *Indian Patent No. 340010 granted on 30th June 2020.***

(E). Sponsored Research Projects: ***Handled Total Research Projects: 9 Nos.***
8 Nos. as ***P.I.* + 1** *Departmental Project at* ***S. No. 7 (****Handled, contributed &defended one of the thrust areas identified in this Project as* ***P.I.****).*

S. No.	**Title**	**Sponsoring Agency**	**Amount (in Lakh)**	**Duration**	**Completed /Ongoing**	**Co-P.I. - if any**
1	Synthesis of Biotemplated Colloidal Nano-structures of Iron Oxide(s) - Analysis of Correlation between their Morphologies and Properties	**CSIR**, New Delhi	~17.0 *(Receipt 15.5)*	July, 2014 to July, 2017 (**Note:** Last instalment received in **2018)**	Completed in **2018** (Report submitted **2019)**	None
2	Synthesis of Nanohybrids of Colloidal Semiconductor Oxides – An Analysis of their Charge Dynamics, Electronic and Magnetic Properties	**CSIR**, New Delhi	14.2	August, 2008- August, 2011 (3 Years)	Completed	None
3	Synthesis and Photochemistry of Composite Metal Semiconductor	**DST** (Nanomission), New Delhi	15.8	Nov., 2004- March, 2008	Completed	None

	Nanostructured Materials					
4	Analysis of Electronic Properties of Nanoclusters of Semiconductors – Development of Semiconductor Based Integrated Photocatalytic Systems	**DST**, New Delhi	21.0	August, 2001-August, 2005	Completed	None
5	Coupled Semicond-uctors as Catalysts for Initiating Photochemical Reactions - Mechanistic Investigations of their Photochemical and Photophysical Behaviour	**DST**, New Delhi	14.5	June, 1995 – March, 2000	Completed	None
6	Preparation of Silver (III) Species and its Stable Complexes-A Kinetic Investigation of their Redox and Photoredox Reactivity	**CSIR**, New Delhi	4.6	1995-1998 (3 Years)	Completed	Dr. P. Rama-murthy, Univ. of Madras
7	Photo- and Radiation Induced Chemical Reactions ***(one of the identified thrust areas)***	**DRS (UGC)**	35.0 (a part of the funds were allotted for this work)	1995-1999	Completed	***Handled & contributed work in this thrust area as PI***
8	Optimization of photophysics of Nanosized Semiconductor for their Application as Chemical Sensors	**UGC**, New Delhi, **1993** *(Granted by Univ. of Roorkee)*	0.25	1993	Completed	None
9	Catalytic Action of Semiconductor Microelectrodes in Photionduced Chemical Reactions	**DST**, New Delhi	9.9	Feb., 1989-March, 1994	Completed	None

(F). Book Chapters Contributed – 02:

S.No.	**Title of Book Chapter with Reference**
(i).	V. Kumar and **Anil Kumar, RNA-Mediated CdS-Based Nanostructures** Luc Ponchon (ed.)**,** *RNA Scaffolds: Methods and Protocols*, Methods in Molecular Biology**,** Springer Science+Business Media, New York **Ch. 16, vol. 1316, P. 195-210 (2015).**
(ii).	S.P. Srivastava and **Anil Kumar, Kinetics and mechanism of Ag^{+} - catalysed oxidation of diols with terminal hydroxyl groups by peroxydisulphate ion**, M. Tsutsui (ed.)**,** Fundamental Research in Homogeneous Catalysis, Plenum Publishing Co., New York, **Vol. 3, 373-396 (1979).**

(G). Details of Ph.D. Theses Supervised: Completed (24) ; During last 5 years Ph.D. awarded (04).

S. No.	**Name of Student/Supervisor Year of Award /Submitted**	**Title of Ph.D. Thesis**
1.	Mr. Ikrar Ahmad **Supervisor: Dr. Anil Kumar (**2023-24) (Ph.D. Awarded ***in 2024***)	"In Situ Synthesis of Heteroatom(s) (N/S/P) Co-doped Porous Reduced Graphene Oxide as Electrode Material(S) for Designing of BinderFree and High-Mass Loaded Sustainable High Performance Aqueous Symmetric Supercapacitor and Electrochemical Sensor"
2.	Dr. Atul Kumar **Supervisor:** Dr. G.D. Varma and **Dr. Anil Kumar (**2022-23) (Ph.D. awarded in 2023)	"Synthesis of Iron Oxide-Reduced Graphene Oxide-based Nanohybrids for Efficient Humidity and NO_2 Gas Sensing"
3.	Dr. Sahil Thareja **Supervisor: Dr. Anil Kumar** 2020-2021 (Ph.D. awarded in 2021)	"Synthesis of N-Doped Reduced Graphene Oxide and its Nanohybrids as Electrode Material(S) for Electrochemical Applications - An Analysis of the Role of Different Aqueous Electrolytes on their Supercapacitive Performance"
4.	Dr. Priyanka **Supervisor: Dr. Anil Kumar** 2020-2021 (Ph.D. awarded in 2020)	"Synthesis of Multistimulus-Responsive Cytidine-5'-Monophosphate Molecule- Mediated Smart Supramolecular Nanohybrid Hydrogels - Their Multifunctional Features and Applications"
5.	Dr. Komal Gupta **Supervisor: Dr. Anil Kumar** 2019-2020 (Ph.D. awarded in 2019)	"Study of RNA-Mediated Fluorescing Colloidal CdSe Nanostructures – Enhanced Photophysics and Morphological Transformation Induced By Conformational Change in RNA"

6.	Dr. Ajay Kumar **Supervisor:** Dr. Himanshu Joshi **& Dr. Anil Kumar** 2018-2019 (Ph.D. awarded in 2019)	"Arsenic Removal in Groundwater using Engineered Maghemite (γ-Fe_2O_3) Nanoparticles"
7.	Dr. Mandeep Kaloti **Supervisor: Dr. Anil Kumar** and Dr. N. Navani (2018-2019)	"Synthesis and Multifunctional Applications of Biomolecule-Mediated Ag-γ-Fe_2O_3 Nanocomposites"
8.	Dr. Mahima Khandelwal **Supervisor: Dr. Anil Kumar** and Dr. R. Nath (2017-18)	"Study on Chemical Reduction of Graphene Oxide into Graphene – their Physicochemical Behavior"
9.	Dr. Umesh Kumar Gaur **Supervisor:** Dr. G.D. Varma and **Dr. Anil Kumar (**2017-18)	"Synthesis of Pure and Doped CuO Nanostructures and their Multifunctional Properties"
10.	Dr. Sudhir Kumar Gupta **Supervisor: Dr. Anil Kumar (**2015-16)	"Synthesis and Physicochemical Properties of Biotemplated β-FeOOH Nanostructures"
11.	Dr. Bhupender Singh **Supervisor: Dr. Anil Kumar (**2014-15)	"Synthesis and Photophysics of RNA-Mediated Colloidal PbSe Nanostructures"
12.	Dr. Aditi Singhal **Supervisor: Dr. Anil Kumar (**2010-2011)	"Synthesis of β – Fe_2O_3 Based Nanostructures - Study of their optical and Magnetic Properties"
13.	Dr. Vinit Kumar **Supervisor: Dr. Anil Kumar (**2010-2011)	"Synthesis, Optical and Electronic Properties of RNA – Mediated Colloidal CdS Nanostructures"
14.	Dr. Vidhi Chaudhary **Supervisor: Dr. Anil Kumar (**2009-2010)	"Synthesis of Ag/CdS Nanocomposites-An Analysis of their Optical and Photophysical Behavior"
15.	Dr. Anshuman Jakhmola **Supervisor: Dr. Anil Kumar** (2007-2008)	"Synthesis and Phtophysics of Q-PbS Based Colloidal Nanostructures"
16.	Dr. Nupur Mathur **Supervisor: Dr. Anil Kumar** (2005-2006)	"Photocatalytic Action of Certain Anilines Mediated by Aqueous TiO_2 Suspensions"

17.	Dr. Shipra Mital **Supervisor: Dr. Anil Kumar** (2003-2004)	"Synthesis, Photophysics and Photocatalytic Action of Surface-Capped Q-CdS Particles"
18.	Dr. Priyanka Gupta **Supervisor:** Dr. R. N. Goyal **and Dr. Anil Kumar** (2001-2002)	"Oxidation Chemistry of Some Biologically Important N-Heterocyclic Compounds"
19.	Dr. Vaishali **Supervisor: Dr. Anil Kumar** (2001-2002)	"Kinetics of Oxidation of Some Amines, Aminoalcohols and diols by Diperiodatoargentate (III)"
20.	Dr. Arvind Kumar Jain **Supervisor: Dr. Anil Kumar** (2001-2002)	"Photophysics and Photocatalytic Behavior of Q-CdS-TiO_2 in the Presence of Certain Aromatics"
21.	Dr. Devendra Pal Singh Negi **Supervisor: Dr. Anil Kumar** (2000-2001)	"Photophysical and Photocatalytic Behaviors of Q-CdS in the Presence of Some Heterocycles"
22.	Dr. Paresh Kumar **Supervisor: Dr. Anil Kumar** and Dr. R.D. Kaushik (1998-1999)	"Kinetics and Mechanism of Oxidation of Certain Amino Acids by Bis (periodato) Argentate (III)"
23.	Dr. Sanjay Kumar **Supervisor: Dr. Anil Kumar** (1995-1996)	"Photoluminescence of Colloidal Cadmium Sulphide Particles in the Presence of Certain Anilines and Indoles – Study of CdS Sensitized Photocatalytic Reactions"
24.	Dr. Ashok Panwar **Supervisor: Dr. Anil Kumar** (1993-1994)	"Preparation of Tetrahydroxoargentate (III) ion and Study of its Reactions with Certain Aromatic Amines"

(H). Conferences: Proceedings 03 (S. Nos. 43, 53 &77) + **88** (Abstracted)/Invited Talks/Symp./Meetings. **Total = 97;** Last 03 Years **-11 Nos.**

S. No.	Author(s)	Title	Name of Conference/ Meeting	Page No. (Other Details)	Date & Year	Conference Venue
1.	**Anil Kumar**	Development of Sustainable Supercapacitor for	10th Annual World Congress	183	May 17-19,	Osaka, Japan

	(Invited Speech)	Superb Electrochemical Performance	of Nano-science &Technology - 2023 (Nano S&T-2023)		2023	
2.	**Anil Kumar** (Invited Speech as a Guest of Honor)	Designing of Certain Sustainable Functional Nanostructures	Nano Meet 2023 (Alumni Meet)	-	March 18, 2023	IIT Roorkee, Roorkee
3.	Ikrar Ahmad and **Anil Kumar***	AMP-Mediated Heteroatom(s) co-doped Porous Reduced Graphene Oxide (N/P-rGO) as Electrode Material for Electrochemical Sensors	35th International Conf. on Nanomaterials and Nanotech-nology	PP-8; p. 49	Dec. 04-06, 2023	IIT Roorkee, Roorkee
4.	Ikrar Ahmad and **Anil Kumar***	Adenosine Monophosphate-Mediated N, P co-doped Porous Reduced Graphene oxide as Electrode Material for High Performance Aqueous Symmetric Supercapacitor	3rd International Conference on Nanomaterials and Nanotechnology,	Poster Presentation	August 24-26, 2023	Melbourne, Australia
5.	S. Thareja and **Anil Kumar***	One Pot In-situ Wet Chemical Synthesis of Mn3O4/nitrogen-doped Reduced Graphene Oxide (N-rGO) Nanohybrids for High-voltage Sustainable Aqueous Symmetric Supercapacitor Devices	International Conference on Materials for Advanced Technologies (**ICMAT2023**)	**A-2165 (W)**	June 26-30, 2023	SUNTEC, Singapore

6.	Ikrar Ahmad and **Anil Kumar**	Synthesis of Cytidine Monophosphate-Assisted Reduced Graphene Oxide (N, P-rGO) as Electrode Material for Supercapacitor Applications	35th International Conf. on Nanomaterials and Nanotech-nology	-	March 25-26, 2022	Berlin, Germany Held Virtually
7.	**Anil Kumar**	Nanotechnology Revolutionizing Societal Applications	National Webinar on Advancement in Modern Experimental Chemistry	Invited Talk as a Resource Person	26th Oct. 2021	GGNK College, Ludhiana, Held Virtually
8.	**Anil Kumar**	Fabrication of Sustainable Advanced Greener Nanomaterials Employing Wet Chemical Approach	International Conference on Advanced Materials for Next Generation Applications	Invited Talk	29th to 30th Sept., 2021	Galgotias Univ., Noida Held Virtually
9.	S. Thareja and **Anil Kumar**	One-pot Greener Synthesis of N-doped Reduced Graphene Oxide for High Performance Symmetric Supercapacitor - An Analysis of the Role of Different Electrolytes for Achieving High Electrochemical Potential Window	International Conference on Advanced Materials for Better Tomorrow	Oral	13-17 July, 2021	IIT (BHU) Held Virtually
10	S. Thareja and **Anil Kumar**	Synergistic Effect of Electrode Material and Electrolyte for Developing High Cell Voltage Aqueous Symmetric Supercapacitor	International Conference on Recent Advances in Chemical Sciences (ICRACS2021)	Oral	14-16 July, 2021.	Depart. of Chemistry, JC Bose University of Science and Technol., YMCA, Faridabad
11	A. Kumar, G.D. Varma, and **Anil Kumar**	Reduced graphene oxide/Magnetite (rGO-Fe_3O_4) nanohybrids based selective room temperature H_2S gas sensor	American Physical Society (APS) March Meeting 2021	Poster	March 15–19, 2021	Held Virtually

12	**Anil Kumar**	Greener Protocols for the Fabrication of Biotemplated Nanostructures - their Multifunctional Applications	Continuing Education Programme on 'Environment and Nanosafety'	Invited Talk	17th to 19th Feb 2020	DRDO, Delhi
13	Sahil Thareja and **Anil Kumar**	High Performance Symmetric Supercapacitor based on Nitrogen doped Reduced Graphene Oxide	DAE-BRNS sponsored conference on Electrochemistry in Industry, Health and Environment-2020	PP-161	21-25 Jan., 2020	BARC, Mumbai
14	**Anil Kumar**	Environmentally Benign Greener Nanostructures for Certain Energy Applications	National Academies Lecture Workshop on " Materials Engineering for Sustainable Environment and Energy"	Invited Talk	10^{th} Jan., 2020	CSIR-CSIO, Chandigarh
15	**Anil Kumar**	Engineering of Nanostructured Materials for Some Light - Induced Energy Applications	National Academies lecture Workshop on " Materials Engineering for Sustainable Environment and Energy"	Invited Talk	9^{th} Jan., 2020	CSIR-CSIO, Chandigarh
16	S. Thareja and **Anil Kumar**	Synthesis and characterization of nitrogen doped reduced graphene oxide as high-performance binder-free supercapacitor electrode material	International Conference on Supercapacitor, Energy Storage & Application (ICSEA 2019)	Poster	8-10 March, 2019	C-MET, Thrissur, Kerala
17	A. Kumar,G.D. Varma, and **Anil Kumar**	Selective Enhanced H_2S Sensing Using rGO-Fe_3O_4 Nanohybrids	3^{rd} International Conf. on Condensed Matter & Amp; Applied Physics-2019	Poster	Oct. 14-15, 2019	Govt. Engineering College Bikaner, Rajasthan
18	**Anil Kumar**	Photophysics of Nucleic acid-Mediated	National Conf. on Advanced Functional	IL-7	20-21 Nov., 2019	Jamia Milia Islamia, New Delhi

		Semiconducting Nanostructures	Materials (NCAFM-2019)			
19	**Anil Kumar**	Photophysics of Nucleic acid-Mediated Semiconducting Nanostructures	National Workshop on Photouminesc-ence and functional Materials (NWPFM-2019)	-	20-21 June, 2019	Univ. of Madras, India
20	Priyanka and **Anil Kumar**	Environmental Applications of Nucleotide Molecule(s) Coated Greener Hydrogels	Internat. Conf. on Advanced Mater., Energy and Environmental Sustainability	Abst. 173	Dec. 14-15, 2018	Univ. of Petroleum and Energy Studies, Dehradun, India
21.	Priyanka and **Anil Kumar**	Synthesis and Analysis of Physiochemical Properties of Biomolecule-Mediated Soft Hydrogels	12th Int. Conf. on Complex Fluids and Soft Matter Sponsored by RSC & ACS	Abstract 48 (Poster No. 7)	Dec. 6-9, 2018	LHC, IIT Roorkee, India
22.	A. Kumar, H. Joshi, and **Anil Kumar**	An approach of utilizing the industry waste in the development of maghemite functionalized nanostructures for arsenic removal'	Water Security and Climate Change Conference, (International Network on Sustainable Water Management in Developing Countries (SWINDON))	151	3rd to 5th Dec., 2018	Nairobi, Kenya
23.	A. Kumar, H. Joshi, and **Anil Kumar**	Exploring the scope of nanoparticles for arsenic removal in groundwater	7th Int. Congress on Arsenic in the Environment (As2018) Organized by Int. Soc. of Groundwater for Sustainable Development	ISBN 9781138 4860-96 *(In Press)*	1st to 6th July, 2018 (CRC Press Publis-her)	Beijing, China

24.	**Anil Kumar** *(Keynote Speaker – Inaugural Lecture)*	Biomolecules Mediated Greener Nanostructures/ Nanohybrids: Study of their Multifunctional Features	National Conf. on Chemical Sciences: An Interdiscipli-nary Approach (CSIA-2018)	1	January 18-21, 2018	Dept. of Chemistry, Modern College of Arts, Science and Commerce, Pune (Sponsored by Dept. of Biotechnol-ogy)
25.	Komal Guptaand **Anil Kumar**	Multifunctional Features of RNA Mediated CdSe Nanostructures	ACS on Campus IIT Roorkee	-	07th Feb., 2018	IIT Roorkee, Roorkee
26.	Komal Guptaand **Anil Kumar**	Mechanistic Analysis of Fluorescence Behavior of RNA-Mediated Colloidal CdSe Nanostructures for Hg^{2+}Sensing	Trombay Symposium on Radiation & Photochemistry (TSRP-2018)	90	03rd - 07th Jan., 2018	BARC, Mumbai
27.	A. Kumar, H. Joshi, and **Anil Kumar**	Assessing the maghemite (γ-Fe_2O_3) nanoparticles in As(V) removal using laboratory scale batch and column experiments	7th International Groundwater Conference-Groundwater Vision 2030	130 (ISBN: 978-93-81891-42-1)	11th - 13th Dec. 2017	NIH and CGWB at New Delhi, India from
28.	Komal Guptaand **Anil Kumar**	RNA-mediated Fluorescent Water Soluble Colloidal CdSe Nanostructures for Environmental Applications	International Conf. on Advances in Materials & Processing: Challenges & Opportunities (AMPCO-2017)	152	30 Nov. – 2nd Dec., 2017	Dept. of Metallurgi-cal& Materials Engg., IIT Roorkee, India
29.	Komal Gupta, Bhupender Singhand	Photophysical Behavior Of Zn^{2+}/PbSe Nanostructures in	International Conf. on Advanced Materials for	102 (PP-52)	March 4-7, 2016	Dept. of Chemistry, IIT Roorkee, Roorkee

	Anil Kumar	the presence of Nile Blue: An Analysis of its sorption Behavior	Energy, Environment and Health (ICAM-2016)			
30.	**Anil Kumar**	Development of Advanced Nanomaterials using Wet Chemical Approach	9th Natl. Seminar on New Paradigm in Chemical Sciences and Analytical Perspectives	16 (Invited Lecture-08)	Feb. 09-10, 2017	Dept. of Chemistry, Punjabi University, Patiala
31.	**Anil Kumar**	Synthesis and multifunctional behavior of some iron oxide and carbon-based greener nanostructures	Prof. R.C. Paul Natl. Symposium on Current Advances in Chemical Sciences	Invited Lecture	Feb. 24-25,2017	Dept. of Chemistry, Chandigarh University, Chandigarh
32.	*M. Kaloti* and **Anil Kumar**	Synthesis and multifunctional applications of chitosan mediated maghemite nanohybrids	Int. Conf. on Advances in Nanomaterials and Nanotechnol-ogy (ICANN-2016)	317 (Poster - 308)	Nov. 4-5, 2016	Centre of Nanosci. & Nanotech., Jamia Millia Islamia, New Delhi
33.	*M. Khandel-wal* and **Anil Kumar**	Synthesis of graphene by chemical reduction of graphene oxide – Study of their energy storage applications	International Conf. on Advanced Materials for Energy, Environment and Health (ICAM-2016)	70 (YRP-3)	March 4-7, 2016	Dept. of Chemistry, IIT Roorkee, Roorkee
34.	*M.Kaloti*, **Anil Kumar** and N. Navani	Synthesis of glucose-mediated Ag-γ-Fe_2O_3multif-unctional nanocomposites – a study of their catalytic and antibacterial studies	International Conf. on Advanced Materials for Energy, Environment and Health (ICAM-2016)	127 (PP-52)	March 4-7, 2016	Dept. of Chemistry, IIT Roorkee, Roorkee
35.	*M. Khandel-*	Amino acid mediated synthesis	Int. Conf. on Materials Science	100 (Biom-	1- 4 March,	Univ. of Delhi, Delhi,

	*wal*and **Anil Kumar**	of N-doped graphene and its supercapacitor applications	& Technology, Conf. Centre	ater. Biodev./ poster)	2016	India
36.	*M. Khandel-wal* and **Anil Kumar**	Environmental friendly synthesis of N-doped graphene-silver nanocomposites with enhanced optical and electrochemical behaviour ,	Second Conference on Microscopy in Materials Science	28 (OP-9)	Feb. 25-27, 2016	Thapar University, Patiala
37.	**Anil Kumar**	Nanotechnology contributing to the development of advanced materials	Short Term Course on Advance Materials and Characterization Techniques	Expert Talk	June 01, 2015	Dr B R Ambedkar National Institute of Technology, Jalandhar - 144011, Punjab
38.	*M. Khandel-wal* and **Anil Kumar**	Malonic acid mediated synthesis of one atom thick graphene sheets and its supercapacitor applications in Mathematical/Statistical and Environmental Dynamics"	5th Int. Conf. on Recent Trends in Applied Physical Chemical Sciences,	1167	May 2-3, 2015 (J. Basic Appl. Engg. Res. 2(13) 2015) (Poster)	"Krishi Sanskriti" at Jawaharlal Nehru University, New Delhi,
39.	**Anil Kumar**	Chemical Strategies for Synthesis of Green Nanomaterials – Chemistry and Future Scope of Iron Oxide/ Oxyhydoxide Based Nanostructures	EMN Guangzhou Meeting 2015– Energy Materials and Nanotechno-logy (Delivered an Invited Talk)	3 (A-02)	03rd - 06th Dec., 2015	Guangzhou, China
40.	**Anil Kumar** and *Sudhir K. Gupta*	Rheological Properties of Biocompatible Superparamagnetic 5′-Guanosine	Int. Conf. Biomater. 2014 on Polymeric Biomater. Bioengg.	Presen-ted poster	October 27-30, 2014	Indian Institute of Technology Delhi (India),

		Monophosphate Mediated Porous Hydrogel of β-FeOOH – Loading, and Release Capabilities of Its Freeze-Dried Gel	&Biodiagnostics			ENEA Rome (Italy) and National Research Council (Italy)
41.	*Sudhir K. Gupta* and **Anil Kumar**	Viscoelastic Properties of Superparamagnetic 5′-Adenosine Monophosphate Mediated Porous β–FeOOH Hydrogel – its Loading, and Release Capabilities	9th India Japan Bilateral Conference (BICON-2014) on Advanced Material Sci. Engg.	(Won best poster award by S.K. Gupta)	Oct. 12-13,2014 .	Biyani Group of Colleges, Jaipur, Rajasthan (India) and JAIST Japan
42.	**Anil Kumar** *(Plenary Lecture 2)*	"Synthesis of Advanced Materials following Wet Chemical Route(s)"	9th India Japan Bilateral Conference (BICON-2014) on Adv. Mater. Sci. Engg.	25-27	Oct. 12-13,2014	Biyani Group of Colleges, Jaipur, Rajasthan (India) and JAIST Japan
43.	**Anil Kumar** *(Invited Lecture)*	Current Advancements in Nanoscience Present Status and Future Prospects of Sustainable Green Technology	Green Nanotechno-logy	Publis-hed in Proce-edings	June 05-06, 2014	Chandigarh University, Chandigarh
44.	**Anil Kumar** and S.K. Gupta	Synthesis, Characterization and Magnetic Properties of 5'-Guanosine Monophosphate Mediated Porous Hydrogel containing β-FeOOH	National Conference on Nanotechnology and Renewable Energy-2014 (NCNRE-2014)	241	April 28-29, 2014	Department of Applied Sciences and Humanities, Jamia Millia Islamia, New Delhi

		Nanostructures				
45.	**Anil Kumar**	Chemical Approach to Design New Material	Natl. Conf. Science Colloquium (Emerging Trends in Basic & Applied Sciences)	2 (Invited Talk)	6- 7th March, 2014	DAV College Jalandhar
46.	**Anil Kumar**	Chemical Sciences Contributing to the Development of New Materials	Nat. Conf. on Recent Trends in Chemical Sciences	8 (IT-5)	25-26, Feb., 2014	Dept. of Chemistry, Guru Jambhesh-war Univ. of Sci & Tech., Hisar
47.	**Anil Kumar**	Emphasis on Interdisciplinary Science & Technological Shift, Contributing to the Development of New Materials	2nd Int. Conf. and Exhibition on Materials Science and Engineering	Honor-able Guest Lecture	07th -9th October 2013 (07th Oct.)	Las Vegas, USA
48.	**Anil Kumar** *(Invited Lecture)*	'Biotemplated Semiconductor/ Metal Nanostructures - their Characteristic Features and Future Prospects'	2nd International Conference and Exhibition on Materials Science and Engineering	Invited Talk	08th Oct. 2013	Las Vegas, USA
49.	**Anil Kumar**	Supramolecular Directed Assemblies of Biotemplated Metal / Semiconductor Nanohybrids	5th Szeged International Workshop on Advances in Nanoscience (SIWAN5)	81-82	24-27 Oct., 2012	Szeged, Hungary,
50.	*Kanchan Yadav*, N. Bogdan, R. Naccac-he, B. F. Zhang, E. M. Rodriguez,	Synthesis of Upconverting $NaGdF_4$ Nanocrystals Doped with Tm^{3+} and Yb^{3+} and its functionalization with Tumour	'World Congress on Biotechnolo-gy	Won 02nd Best Poster Presentat ion Prize	04th to 06th May 2012	Leonia Int. Convention Centre, Hyderabad

	Anil Kumar and J. A. Capobianco	Imaging and Treatment'				
51.	**Anil Kumar** *(Invited Lecture)*	Development of Colloidal Nanomaterials	7th Natl. Symp. & Conf. on Solid State Chem. And Allied Areas (ISCAS -2011)	39 (IL4)	Nov. 24 – 26, 2011	Dept. of Chemistry, Faculty of Natural Sci. Jamia Millia Islamia, New Delhi
52.	*Linu, M.* and **Anil Kumar**	Synthesis of γ – Fe_2O_3 Based Nanostructures – Study of their Optical and Magnetic Properties	Third Intl. Conf. on Frontiers in Nanoscience and Technology	-	August 2011	Cochin Nano - 2011
53.	**Anil Kumar** *(Invited Lecture)*	Optical and Electronic Properties of Colloidal Semiconductor Nanohybrids	3rd Asia Pacific Symp. On Rad. Chem. (APSRC-2010) and DAR BRNS 10th Biennial TrombaySymp. Rad. &Photochem. (TSRP-2010)	206 – 209 (Invited Talk ITPC-13) (Publis-hed in Proc.)	Sept. 14 -17, 2010	Lonavala, India
54.	**Anil Kumar** (Chaired a Session on '*Applicati-ons of Catalysts in Industry)*	Photocatalytic Applications of Some Semiconductor Nanosystems.	International Symposium on Ostwald's 100 Years of Catalysis in Chemical Research	*'Cataly-sis in Green Chemi-stry / Nano-materi-als'*	Nov. 03 – 04, 2009	Allahabad Agricultural Institute, Allahabad
55.	**Anil Kumar** *(Plenary Lecture)*	Biomolecule(s) – Templated Colloidal Metal /Semiconductor Nanohybrids,	Indo-French Workshop cum International Conference on Nanosci. &Nanotechnol.	87 in (Int. Conf. on 16th Oct.)	October 12-16, 2009	Ansal Institue of Technology, Gurgaon
56.	**Anil Kumar** and V. Kumar	Morphological Changes in Nucleotide-Capped	Intl. Conf. on Nanomaterials and Devices	77	Dec. 11-13, 2008	IIT Roorkee, India

		CdS Nanostructures	Processing and Applications (NADPA 2008)			
57.	**Anil Kumar** and *V. Chaudha-ry*	Electronic Properties of Biotemplated Q-CdS-Ag Nanocomposites,	Intl. Conf. on Nanomaterials and Devices Processing and Applications (NADPA 2008)	77	Dec. 11-13, 2008	IIT Roorkee, India
58.	**Anil Kumar** and *Aditi Singhal*	Synthesis of Fe_2O_3/Ag Core Shell Nanocomposites,	Intl. Conf. on Nanomaterials and Devices Processing and Applications (NADPA 2008)	76	Dec. 11-13, 2008	IIT Roorkee, India
59.	**Anil Kumar** *(Invited Lecture)*	Nanoscience and Nanotechnology – Potential & Challenges	National Convention of Chemistry Teachers (NCCT -2008)	Chaired a Techn-ical Session	Nov. 8 & 9, 2008	HNB Garhwal University, Srinagar
60.	**Anil Kumar**, A. Jakhmola and *V. Chaudha-ry*	Synthesis and photophysics of ZnS/PbS/ZnS quantum dot quantum well – An analysis of dynamics of charge carriers	International Conf. on Nanoscience and Technology (ICONSAT-2008)	A105	Feb. 27-29, 2008	Indira Gandhi Centre for Atomic Research, DAE, Kalpakkam, India
61.	**Anil Kumar** *(Invited Lecture)*	Photochemistry of Some Nanocolloids	National Symposium on Radiation and Photochemi-stry (NSRP-2007)	IT-2	Jan. 29 – 31 (2007)	Univ. of Madras, Chennai
62.	**Anil Kumar**	Photochemistry of Surface Modified Semiconductor Nanocomposites	National Symposium on Radiation and Photochemistry (NSRP-2007)	IT-2	January 29 – 31 (2007)	Univ. of Madras, Chennai
63.	**Anil Kumar** and N. Mathur	Photocatalytic Decomposition of Anilines at the Interface of Surface	Intl- Meeting of Photochem-istry, Photocatalysis and their	Oral Presentat ion	March 29-31, 2006	Agadir, Morocco

		Modified TiO_2 – Influence of Loading of Carbonate Ions	Environment-al Applications (Photocat 2006)			
64.	**Anil Kumar** *(Invited Lecture)*	Applications of Pulse Radiolysis to Photochemistry – An understanding of Semiconductor Based Photochemical Systems	Workshop on Pulse Radiolysis and its Applications	Invited Presen-tation	June 25, 2005.	Poona Univ., Pune
65.	**Anil Kumar** and N. Mathur	Photooxidation of Aniline at the Interface of TiO_2 Suspensions	UGC sponsored symposium under DRS	25	Oct. 18, 2003	IIT Roorkee, Roorkee,
66.	**Anil Kumar** and S. Mital	Photochemistry of 6-Dimethylaminopuri ne-capped Cadmium Sulfide Nanoparticles	UGC sponsored symposium under DRS	24	Oct. 18, 2003	IIT Roorkee, Roorkee,
67.	**Anil Kumar**	Photochemistry of Surface Modified Semiconductor Nanocomposites	National Symposium on Radiation and Photochemistry (NSRP-2003)	IT-8	March 3-5, 2003	IIT, Kanpur
68.	**Anil Kumar**	Photophysical and Photochemical Aspects of Nanoparticles of Semiconductors – Investigations on Q-CdS	7^{th} Intl. Conf. on Solar Energy and Applied Photochemis-try (Solar'03) combined with 4^{th} Intl. Workshop on Environ. Photochemistry (Enpho '03)	Oral Presentat ion made under Special Session on Nano-sci-&Nanot-echnol-ogy	$23\text{-}28^{th}$ Feb., 2003	Luxor Egypt
69.	**Anil Kumar** and Arvind Kumar Jain	Photophysics and Photocatalytic Properties of Sandwich Q-CdS-TiO_2	Workshop on Radiation and Photochemistry	27	January 4-5, 2002	Pune University

		Semiconductors				
70.	**Anil Kumar** and S. Mital	Electronic Properties of Q-CdS Stabilized by Adenine.	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	16	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
71.	**Anil Kumar** and A.K. Jain	Effect of doping of Ag^+ on the photophysics of mixed colloidal CdS – TiO_2 system – correlation of photophysics with its photocatalytic activity	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	15	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
72.	*D.P.S. Negi* and **Anil Kumar**	Photophysical and Photocatalytic Behaviour of $Cd(OH)_2$ – Coated Q-CdS in the Presence of Certain Heterocycles.	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	TH - 7	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
73.	R.N. Goyal, **Anil Kumar** and P. Gupta	Mechanisms of electrochemical and persulfate oxidation of tryptophol.	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	K-4	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
74.	**Anil Kumar**, Vaishali and P. Ramamurt-hy	Kinetics of oxidation of 3-amino-1-propanol and certain diamines by silver (III).	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	K-3	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
75.	**Anil Kumar,** *P. Kumar* and Vaishali	Kinetics and Mechanism of Oxidation of Ethylenediamine-tetracetic acid by Diperiodato-argentate (III) ion	ISRAPS Natl. Symp. on Rad. and Photo-chemistry	K-2	Feb. 21-23, 2001	Univ. of Roorkee, Roorkee
76.	**Anil Kumar**	Electronic Properties of Surface Modified Q-CdS Particles – A Comparison of their Photocatalytic	Symposium on Recent Trends in Photochemical Sciences,	34 (L-30)	January 8 – 10, 2001	RRL, Trivandrum

		Activity with Naked CdS Clusters				
77.	**Anil Kumar**	Photophysical and photochemical aspects of certain quantized coupled semiconductors.	Trombay Symposium on Radiation and Photochemis-try	38 (Proce-edings, Part II, 499-505 (2000).	Jan. 12-17, 2000	BARC, Mumbai
78.	**Anil Kumar,** D.P.S. Negi and Arvind Kumar Jain	Photophysics and Photochemistry of $Cd(OH)_2$ -coated Quantized CdS and colloidal CdS-TiO_2 Semiconductors - Study of Certain Redox Reactions at their Interface	2nd Asian Photochemis-try Conference	87	June 27 – 30, 1999	Taejon, South Korea
79.	**Anil Kumar,** *Vaishali* and P. Ramamur-thy	Kinetics and Mechanism of Oxidation of Ethylenediamine and Related Compounds by Diperiodato-argentate (III) ion	Seminar on Ultrafast Processes in Biology, Chemistry and Physics	43	March 11-13, 1999	Chennai
80.	**Anil Kumar** and *D.P.S. Negi*	Photophysical Behaviour of Cd $(OH)_2$ -coated CdS Particles in the Presence of dl-Tryptophan-study of CdS-initiated Photocatalytic Reaction	National Symposium on Radiation and Photochemistry	PC-7	Feb. 15-17, 1999	Sambalpur
81.	**Anil Kumar**	Photocatalysis Initiated by Semiconductors - Mechanistic Analysis of Colloidal CdS Induced Photochemical Reactions of Certain Organics	Workshop on Recent trends in Photochemical Sciences	48	Jan. 7-9 (1998)	RRL, Trivandrum

82.	**Anil Kumar**	Investigation of Primary Photophysical and Photochemical Events in Irradiated Quantized Semiconductor Particles	Workshop on National Centre for Ultrafast Processes	01	Nov. 28, 1997	Univ. of Madras, Madras
83.	**Anil Kumar** and *D.P.S. Negi*	Study of photophysical and photochemical behaviour of cadmium hydroxide coated cadmium sulphide particles	Recent Trends in Instrumental Methods of Analysis	78	Sept. 18-20, 1997	Univ. of Roorkee, Roorkee
84.	**Anil Kumar,** *Vaishali* and P. Ramamurthy	Kinetics of Oxidation of Ethylene glycol by Diperiodato-argentate (III) - a Comparison of Thermal and Photochemical Reactions	Recent Trends in Instrumental Methods of Analysis, Roorkee	69	Sept. 18-20, 1997	Univ. of Roorkee, Roorkee
85.	**Anil Kumar** and *P. Kumar*	Kinetics of Oxidation of Nitrilotriacetic acid by Diperiodato-argentate (III)	Recent Trends in Instrumental Methods of Analysis, Roorkee	68	Sept. 18-20, 1997	Univ. of Roorkee, Roorkee
86.	**Anil Kumar** and S. Kumar	Photocatalysis Initiated by Quantized CdS Particles - a Mechanistic Investigation	Asian Photochemis-try Conf.	136	June 23-26, 1996	Hong Kong
87.	**Anil Kumar**	Study of Early Events in Photochemical Reactions Initiated by Quantized Semiconductor Particles	DST Workshop on National Centre for Ultrafast Processes	13	Jan. 19-20, 1995	Poona Univ., Pune
88.	**Anil Kumar** and S. Kumar	Enchancement of Luminescence of CdS in the Presence	XVth IUPAC Symposium of Photochemis-try	325	July 17-22, 1994	Prague, Czech Republic

		of Indoles - Study of CdS Sensitized Reactions of Indoles				
89.	**Anil Kumar**	Photophysical and Photochemical Processes Initiated by Nanometer-sized Particles of Semiconductors	Trombay Symposium on Radiation and Photochemis-try	116	Jan. 17-21, 1994	BARC, Bombay
90.	**Anil Kumar**	Fast Kinetics Research in the Study of Nanoparticles	Discussion Meeting on Fast Chemical Reactions	Invited Talk	July 30-31, 1993	Inter University Consortium for DAE Facilities, Indore
91.	**Anil Kumar**	Electron-transfer Reactions in Semiconductor Microelectrodes	Conference on Photochemistry and Laser Chemistry	Oral Presen-tation	Dec. 19-21, 1990	RRL, Trivandrum
92.	**Anil Kumar**	Electron and Hole Injection of Colloidal CdS by means of Pulse Radiolysis	Mini-symposium held at Max-Planck-Institut, Mulheium	Oral Presen-tation (14^{th} May 1987)	May 13-15, 1987	Max-Planck-Institut, Mulheium/Ruhr, West Germany
93.	**Anil Kumar**	Catalytic Action of Colloidal Microelectrodes in Photoinduced Chemical Reactions	National Seminar on Advances in Photochemis-try and Applications	Oral Presen-tation	Feb., 1985.	Madras,
94.	**Anil Kumar** and P. Neta	Oxidation of Anilines by Ag (II) Ions	Indian Science Congress Association	Oral Presen-tation	Jan., 1983	Tirupati,
95.	S.P. Srivastava and **Anil Kumar**	Kinetics and Mechanism of Ag^{+} - catalyzed Oxidation of Diols with Terminal Hydroxyl groups by Peroxydisulphate Ion	Indian Science Congress Association	Oral Presen-tation	Jan. (1978)	Ahemdabad
96.	S.P.	Kinetics and	Convention of	Oral	Dec.	Bangalore

	Srivastavaa nd **Anil Kumar**	Mechanism of Ag^{+} - Catalyzed Oxidation of Glycerol by Peroxydisulphate Ion - An Analysis of Consecutive Reactions	Chemists	Presen-tation	1976	
97.	S.P. Srivastava and **Anil Kumar**	Kinetics and Mechanism of Ag^{+} - Catalyzed Oxidation of Glycerol by Peroxydisulphate Ion - A Reinvestigation.	Convention of Chemists	Oral Presen-tation	Dec. 1975	Univ. of Roorkee, Roorkee

(I) **Total Papers (105) and in Peer Reviewed Journals 104** (In descending order of publication)

List of Publications in Journals			In descending order of publication year ↓		
S. No.	**Author(s)**	**Title**	**Journal**	**Vol., Page Nos.**	**Year**
1	I. Ahmad and **Anil Kumar***	Heteroatom(s) (N, S, P) Co-doped Reduced Graphene Oxide-based Binder-free Novel Energy Storage Electrode Material for High Energy Density Supercapacitor	**Adv. Sustain. Syst.,** DOI:10.1002/adsu.202400174 **(2024).**	**-**	**2024**
2	I. Ahmad and **Anil Kumar***	In -situ synthesis of N, S co-doped electrode material by an environmentally benign method towards designing of high voltage (3.0 V) binder-free sustainable aqueous symmetric supercapacitor	**Chem. Engg. J.**	**477, 146972 (1-16)**	**2023**
3	Atul Kumar, **Anil Kumar***, G.D Varma	Flexible humidity-tolerant γ-Fe_2O_3-rGO-based nanohybrids for energy efficient selective NO_2 gas sensing	***New J. Chem.***	47 (NJ047010), 4871-4879	**2023**
4	S. Thareja and **Anil Kumar***	One-pot *In-situ* Synthesis of Mn_3O_4/N-rGO Nanohybrids for the Fabrication of High Cell Voltage Aqueous Symmetric Supercapacitor – An Analysis of	**Energy Fuels,**	**36, 24, 15177-15187**	**2022**

		Redox Activity of Mn_3O_4 Towards Stabilizing the High Potential Window in Salt-In-Water and Water-In-Salt Electrolytes			
5	Atul Kumar, H Joshi, **Anil Kumar**	Arsenate Removal from the Groundwater Employing Maghemite Nanoparticles	**Water**	**14 (22), 3617**	**2022**
6	S. Thareja and **Anil Kumar***	*In-situ* Wet Synthesis of N-ZnO/N-rGO Nanohybrids as Electrode Material for High Performance Supercapacitor and Simultaneous Non-Enzymatic Electrochem-ical Sensing of Ascorbic acid, Dopamine and Uric acid at their Interface	**J. Phys. Chem. C** doi.org/10.1021/acs.jpcc.1c08413	**125,** 24837-24848	**2021**
7	Atul Kumar, **Anil Kumar***, G.D Varma	Ultrafast resistive type γ-Fe_2O_3-rGO nanohybrids based humidity sensor – a respiratory monitoring tool	***J. Mater. Chem. C***	***9,*** 8002-8010	**2021**
8	S. Thareja and **Anil Kumar***	Water-in-salt' electrolyte based high voltage (2.7 V) sustainable symmetric supercapacitor with superb electrochemical performance - an analysis of the role of electrolytic ions in extending the cell voltage	**ACS Sustainable Chem. Eng.**	***9,*** 2338-2347	**2021**
9	Ajay Kumar, H. Joshi and **Anil Kumar**	Remediation of Arsenic by Metal/ Metal Oxide Based Nanocomposites/ Nanohybrids: Contamination Scenario in Groundwater, Practical Challenges, and Future Perspectives.	**Separation and Purification Rev.** DOI: 10.1080/**15422119.2020.1744649**	***50,*** 283-314	**2021**
10	Priyanka and **Anil Kumar***	Smart soft supramolecular hybrid hydrogels modulated by Zn^{2+} / Ag NPs with unique multifunctional properties and applications	**Dalton Trans.**	***49,*** 15095-15108	**2020**
11	Priyanka	Multistimulus-Responsive	**ACS Omega**	***5,*** 13672-	**2020**

	and **Anil Kumar***	Supramolecular Hydrogels Derived by *in situ* Coating of Ag Nanoparticles on 5'-CMP-Capped β-FeOOH Binary Nanohybrids with Multifunctional Features and Applications		13684	
12	Sahil Thareja and **Anil Kumar***	High Electrochemical Performance of 2.5 V Aqueous Symmetric Supercapacitor based on Nitrogen doped Reduced Graphene Oxide.	**Energy Technol.** ***DOI: 10.1002/ente. 201901339***	***8*, 1901339 (1 to 11)**	**2020**
13	**Anil Kumar** and Priyanka	Environmentally benign pH-responsive cytidine-5'-monophosphate molecule-mediated akaganeite (5'-CMP-β-FeOOH) soft supramolecular hydrogels induced by the puckering of ribose sugar with efficient loading/release capabilities.	**New J. Chem.**	***43*,** 14997-15013	**2019**
14	Komal Gupta and **Anil Kumar***	Zn^{2+}/Cd^{2+}-RNA-mediated Intense White-light-emitting Colloidal CdSe Nanostructures in Aqueous Medium – Enhanced Photophysics and Porous Morphology Induced by Conformational Change in RNA.	**J. Mater. Chem. C**	***7*,** 692-708	**2019**
15	**Anil Kumar** and Komal Gupta	Supramolecular Assisted RNA-Templated Fluorescing Colloidal CdSe QDs Organized in Porous Morphology in the Presence of 1,3-Diaminopropane – Study of their Multifunctional Behavior	**J. Phys. Chem. C**	***122*,** 7898−7915	**2018**
16	M. Kaloti and **Anil Kumar***	Sustainable Catalytic Activity of Ag-Coated Chitosan-Capped Fe_2O_3 Superparamagnetic Binary Nanohybrids (Ag--Fe_2O_3@CS) for the Reduction of Environmentally Hazardous Dyes - A Kinetic Study of the Operating Mechanism Analyzing Methyl Orange Reduction	**ACS Omega**	***3*** (2), 1529–1545	**2018**
17	M. Khandel-	Electrochemical behavior of glycine mediated N-doped	**New J. Chem.**	***41*,** 8333-8340	**2017**

	wal and **Anil Kumar***	reduced graphene oxide			
18	**Anil Kumar** and Komal Gupta	RNA-mediated fluorescent colloidal CdSe nanostructures in aqueous medium - analysis of Cd^{2+} induced folding of RNA associated with morphological transformation (0D to 1D)), change in photophysics and selective Hg^{2+} sensing.	**J. Mater. Chem. (A)**	***5,*** 6146-6163	**2017**
19	S. Firdoz and **Anil Kumar***	ZnO nanoparticles and their acarbose-capped nanohybrids as inhibitors for human salivary amylase.	***IET Nanobio-technol.*** **doi:0.1049/iet-nbt.2016.0115**	**11 (3),** 329-335	**2017**
20	M. Kaloti and **Anil Kumar***	Synthesis of chitosan-mediated silver coated γ-Fe_2O_3 (Ag-γ-Fe_2O_3@Cs)superparamagnetic binary nanohybrids for multifunctional applications.	**J. Phys. Chem. C**	***120,*** 17627-17644	**2016**
21	M. Khandel-wal and **Anil Kumar***	One-pot environmental friendly amino acid mediated synthesis of N-doped graphene-silver nanocomposites with enhanced multifunctional behavior	**Dalton Trans.**	***45,*** 5180-5195	**2016**
22	M. Khand-elwal and **Anil Kumar***	Supercapacitor applications of 2-aminoisobutyric acid mediated N-doped graphene.	**Adv. Mater. Proc.**	***1,*** 08-**13**	**2016**
23	M. Khandel-wal and **Anil Kumar***	One-step chemically controlled wet synthesis of graphene nanoribbons from graphene oxide for high performance supercapacitor applications.	**J. Mater. Chem. (A)**	***3,*** 22975-22988	**2015**
24	M. Kaloti, **Anil Kumar*** and N.K. Navani	Synthesis of glucose-mediated Ag - γ-Fe_2O_3 multifunctional nanocomposites in aqueous medium - a kinetic analysis of their catalytic activity for 4-nitrophenol reduction.	**Green Chem.**	***17,*** 4786-4799	**2015**
25	U. Kumar Gaur, **Anil Kumar***	Fe-induced morphological transformation of 1-D CuO nanochains to porous nanofibers	**J. Mater. Chem. C**	***3,*** 4297-4307	**2015**

	and G. D. Varma	with enhanced optical, magnetic and ferroelectric properties.			
26	**Anil Kumar,** B. Singh and K. Gupta	Photophysical aspects of varying Zn^{2+}/ PbSe nanostructures mediated by RNA leading to the formation of honeycomb-like novel porous morphology	**J. Phys. Chem. C**	***119,*** 6314-6323	**2015**
27	**Anil Kumar** and S. K. Gupta	Supramolecular–directed novel superparamagnetic 5'-adenosine monophosphate templated β-FeOOH hydrogel with enhanced multi-functional properties.	**Green Chem.**	***17,*** 2524–2537	**2015**
28	**Anil Kumar** and M. Khandel-wal	A novel synthesis of ultra-thin graphene sheets for energy storage applications using malonic acid as a reducing agent.	**J. Mater. Chem. A,**	***2,*** 20345–20357	**2014**
29	**Anil Kumar** and S.K. Gupta	5'-Guanosine monophosphate mediated biocompatible porous hydrogel of β-FeOOH - viscoelastic behavior, loading and release capabilities of freeze dried gel.	**J. Phys. Chem. (B)**	***118,*** 10543-10551	**2014**
30	**Anil Kumar** and V. Kumar	Biotemplated inorganic nanostructures: Supramolecular directed nanosystems of semiconductor(s)/metal(s) mediated by nucleic acids and their properties.	**Chem. Rev. (ACS)**	***114,*** 7044-7078	**2014**
31	**Anil Kumar** and M. Khandelwa l	Amino acid mediated functionalization and reduction of graphene oxide – synthesis and the formation mechanism of nitrogen-doped graphene**.**	**New J. Chem.**	***38,*** 3457-3467	**2014**
32	U. K. Gaur, **Anil Kumar** and G. D. Varma	The synthesis of self-assembled 1-D CuO nanochains in aqueous medium and a study of their multifunctional features.	**CrystEngC-omm**	***16***, 3005–3014	**2014**
33	**Anil Kumar** and S.K. Gupta	Synthesis of 5'-GMP-mediated porous hydrogel containing β - FeOOH nanostructures: optimization of its morphology, optical and magnetic properties.	**J. Mater. Chem. (B)**	***1***, 5818-5830	**2013**

34	**Anil Kumar** and B. Singh	Optoelectronic properties of dual emitting RNA mediated colloidal PbSe nanostructures.	**Dalton Trans.**	***42***, 11455–11464	**2013**
35	**Anil Kumar** and S.K. Gupta	Synthesis of adenine mediated superparamagnetic colloidal β-FeOOH Nanostructure(s) – study of their morphological changes and magnetic behavior.	**J. Nanopart. Res.**	15:1466, 1-16 *(DOI 10.1007/s11051-013-1466-z)*	**2013**
36	**Anil Kumar** and B. Singh	Zn^{2+} induced folding of RNA to produce honeycomb like RNA - mediated fluorescing Zn^{2+}/PbSe nanostructures.	**J. Phys. Chem. (C)**	***117***, 5386–5396	**2013**
37	**Anil Kumar,** V. Chaudhary and Vinit Kumar	Synthesis of guanosine 5′-monophosphate (GMP) - mediated Ag/CdS nanohybrids – their self-assembly and optoelectronic properties.	**Eur. J. Inorg. Chem.**	269-279	**2013**
38	**Anil Kumar** and B. Singh	RNA templated water soluble Mg^{2+}/ PbSe porous nanostructures with dual fluorescence.	**RSC Advances**	***2***, 9079–9090	**2012**
39	**Anil Kumar** and A. Singhal	Optical and magnetic behavior of Ag encapsulated β -Fe_2O_3 core-shell hollow Nanotubes.	**Mater. Chem. Phys.**	***131***, 230-240	**2011**
40	**Anil Kumar** and B. Singh	Synthesis and photophysics of red emitting RNA templated PbSe nanostructures.	**Chem. Commun.**	***47*** (14), 4144 - 4146	**2011**
41	A. Agarwal, H. Joshi and **Anil Kumar**	Synthesis, characterization and application of nano lepidocrocite and magnetite in the degradation of carbon tetrachloride.	**S. Afr. J. Chem.**	***64***, 218-224	**2011**
42	**Anil Kumar** and A. Singhal	Optical, photophysical and magnetic behavior of GMP-templated binary (β - Fe_2O_3/CdS) and ternary (β-Fe_2O_3/Ag/CdS) nanohybrids.	**J. Mater. Chem.**	***21***, 481-496	**2011**

43	S. Firdoz, Ma Fang, XiuliYue, Zhifei Dai, **Anil Kumar**, Jiangbin	A novel amperometric biosensor based on single walled carbon nanotubes with acetylcholine esterase for the detection of carbaryl pesticide in water.	**Talanta**	***83***, 269 - 273	**2010**
44	**Anil Kumar** and V. Kumar	Synthesis and optical properties of Guanosine 5′-monophosphate - mediated CdS nanostructures: An analysis of their structure, morphology and electronic properties.	**Inorg. Chem.**	***48***, 11032-11038	**2009**
45	**Anil Kumar,** A. Jakhmola and V. Chaudhary	Synthesis and photophysics of colloidal ZnS/PbS/ZnS nanocomposites - an analysis of dynamics of charge carriers.	**J. Photochem. Photobiol. A: Chem.**	***208***, 195-202	**2009**
46	**Anil Kumar** and V. Kumar	Supramolecular – directed synthesis of RNA-mediated CdS/ZnS nanotubes.	**Chem. Commun.**	5433-5435	**2009**
47	**Anil Kumar** and A. Singhal	Synthesis of colloidal silver iron oxide nanoparticles – study of their optical and magnetic behavior.	**Nanotech-nology**	***20***, 295606-295616	**2009**
48	**Anil Kumar** and A. Jakhmola	RNA-templated fluorescent Zn/PbS (PbS + Zn^{2+}) supernanostructures.	**J. Phys. Chem. C**	***113***, 9553-9559	**2009**
49	**Anil Kumar** and V. Chaudhary	Time resolved emission studies of Ag-adenine-templatedCdS (Ag/CdS) nanohybrids.	**Nanotech-nology**	***20***, 095703 - 095712	**2009**
50	**Anil Kumar** and V. Kumar	Self-assemblies from RNA-templated colloidal CdS nanostructures.	**J. Phys. Chem. C,**	***112***, 3633-3640	**2008**
51	**Anil Kumar** and A. Singhal	Synthesis of colloidal β-Fe_2O_3 nanostructures - influence of addition of Co^{2+} on their morphology and magnetic behavior.	**Nanotechno-logy**	***18***, 475703	**2007**
52	**Anil Kumar** and V.	Optical and photophysical properties of Ag/CdS nanocomposites – an analysis of	**J. Photochem. Photobiol.**	***189***, 272-279	**2007**

	Chaudhary	relaxation of charge carriers.	**A: Chem.**		
53	**Anil Kumar** and A. Jakhmola	RNA – mediated fluorescent Q-PbS nanoparticles.	**Langmuir (Lett.)**	***23***, 2915-2918	**2007**
54	**Anil Kumar** and N. Mathur	Photocatalytic degradation of aniline at the interface of TiO_2 suspensions containing carbonate ions.	**J. Colloid Interface Sci.**	***300***, 244-252	**2006**
55	**Anil Kumar** and A. Jakhmola	Photophysics and charge dynamics of Q-PbS based mixed ZnS/PbS and PbS/ZnS semiconductor nanoparticles.	**J. Colloid Interface Sci.**	***297***, 607-617	**2006**
56	**Anil Kumar**	Physicochemical and photochemical properties of nanoscale semiconductors - dynamics of the charge carriers.	**Natl. Acad. Sci. Lett.** *(Published as Lead Article)*	***28***, 1-11	**2005**
57	**Anil Kumar** and N. Mathur	Photocatalytic oxidation of aniline using Ag^+-loaded TiO_2 suspensions.	**Appl. Catal. A: Gen.**	***275***,189-197	**2004**
58	**Anil Kumar** and S. Mital	Electronic and photocatalytic properties of purine(s)-capped Q-CdS nanoparticles in the presence of tryptophol.	**J. Mol. Catal. A: Chem.**	***219***, 65-71	**2004**
59	**Anil Kumar** and S. Mital	Synthesis and photophysics of 6-dimethylaminopurine-capped Q-CdS nanoparticles – a study of its photocatalytic behavior.	**Int. J. Photoenerg.**	***6***(2), 61-68	**2004**
60	**Anil Kumar** and S. Mital	Photophysics and photocatalytic behavior of composite CdS-purine nanoparticles in the presence of certain indoles.	**J. Colloid Interface Sci.**	***265***, 432-438	**2003**
61	**Anil Kumar** and A.K. Jain	Photophysics and photocatalytic properties of Ag^+ - doped composite (CdS-TiO_2) colloidal semiconductor.	**J. Photochem. Photobiol. A: Chem.**	***156***, 207-218	**2003**
62	R.N. Goyal, **Anil Kumar** and P. Gupta	Electrochemical and persulphate mediated oxidation of indole -3-ethanol	**Indian J. Chem.**	***41A***, 719-726	**2003**
63	**Anil Kumar** and S. Mital	Synthesis and photophysics of purine-capped Q-CdSnanocrystallites.	**Photochem. Photobiol. Sci.**	***1***, 737-741	**2002**
64	**Anil**	Electronic properties of Q-CdS	**J. Colloid**	***240***, 459-	**2001**

	Kumar and S. Mital	clusters stabilized by adenine	**Interface Sci.**	466	
65	**Anil Kumar,** Vaishali and P. Ramamur-thy	Kinetics of oxidation of 3-amino-1-propanol and related compounds by silver (III) species.	**J. Chem. Soc. Perkin Trans.**	***2***(7), 1174 – 1179	**2001**
66	R.N. Goyal, **Anil Kumar** and P. Gupta	Oxidation chemistry of indole -3-methanol	**J. Chem. Soc. Perkin Trans.**	***2*** (4), 618-623	**2001**
67	**Anil Kumar** and D.P.S. Negi	Photophysics and photocatalytic properties of $Cd(OH)_2$ -coated Q-CdS clusters in the presence of guanine and related compounds	**J. Colloid Interface Sci.**	***238***, 310-317	**2001**
68	**Anil Kumar** and A. K. Jain	Photophysics and photochemistry of colloidal CdS-TiO_2 coupled semiconductors - Photocatalytic oxidation of indole	**J. Mol. Catal. A: Chem.**	***165***, 265-273	**2001**
69	**Anil Kumar** and D.P.S. Negi	Photocatalytic and photophysical behaviours of $Cd(OH)_2$ - coated Q-CdS in the presence of tryptophan	**J. Photochem. Photobiol. A: Chem.**	***134***, 199-207	**2000**
70	**Anil Kumar,** Vaishali and P. Ramamurth y	Kinetics and mechanism of oxidation of ethylenediamine by diperiodatoargentate (III) ion.	**Int. J. Chem. Kinet.**	***32***, 286-293	**2000**
71	**Anil Kumar** and A. Kumari	Photocatalytic oxidative C-C bond cleavage of 1,2-ethanediol initiated by aqueous titanium dioxide dispersion - influence of Ag^+ on the catalytic activity	**Res. Chem. Intermed.**	***25***, 695-708	**1999**
72	**Anil Kumar,** P. Kumar and P.Ramam-urthy	Kinetics of oxidation of glycine and related substrates by diperiodatoargentate (III)	**Polyhedron**	***18***, 773-780	**1999**
73	**Anil Kumar** and P. Kumar	Kinetics and mechanism of oxidation of nitrilotriacetic acid by diperiodatoargentate (III)	**J. Phys. Org. Chem.**	***12***, 79-85	**1999**
74	**Anil Kumar** and	Separation and quantification of aniline and its oxidation products	**Chem. Anal. (warsaw)**	***43***, 93-97	**1998**

	A. Panwar				
75	**Anil Kumar** and S. Kumar	Colloidal CdS induced photocatalytic reaction of 2-methylindole - mechanistic analysis of oxidation of indoles	**J. Phys. Org. Chem.**	***11***, 277-282	**1998**
76	**Anil Kumar,** S. Kumar and D.P.S. Negi	Photocatalytic oxidative C-C bond cleavage of the pyrrole ring in 3-methylindole induced by colloidal CdS particles	**J. Chem. Res. (S)**	***1***, 54-55	**1998**
77	**Anil Kumar** and A. Panwar	Kinetics of oxidation of 2,4-, 2.6-, 3,4- and N, N-dimethylanilines by $[Ag(OH)_4]^-$	**Oxidn. Commun.**	***20***, 258-266	**1997**
78	**Anil Kumar** and S. Kumar	Catalytic effect of Ag^+ in colloidal CdS- induced photooxidation of aniline	**Chem. Lett.**	711-712	**1996**
79	**Anil Kumar** and S. Kumar	Enhancement of luminescence of colloidal CdS in presence of indoles - study of CdS sensitized reaction of indole	**J. Photochem. Photobiol. A: Chem.**	***83***, 251-256	**1994**
80	**Anil Kumar** and A. Panwar	Kinetics of oxidation of aniline and xylidine by tetrahydroxoargentate ion.	**Bull. Chem. Soc. (Japan)**	***67***, 1207-1212	**1994**
81	**Anil Kumar** and A. Panwar	Gas chromatographic separation of isomeric aminophenols, aniline, phenol, benzoquinone and azobenzene on HP-1 capillary column	**Mikrochim. Acta**	***111***, 177-182	**1993**
82	**Anil Kumar** andS. Kumar	Photoluminescence of colloidal cadmium sulfide in the presence of aniline - study of the CdS – sensistizedphotocataytic reaction	**J. Photochem. Photobiol. A: Chem.**	***69***, 91-95	**1992**
83	**Anil Kumar**	Photoinduced processes in colloidal semiconductors – physicochemical properties and applications.	**ISRAPS Bulletin** (Published by ISRAPS)	***3***(1), 2-5	**1992**
84	S.P. Srivastava, **Anil Kumar,** S. Sinha and A. Panwar	Selective oxidation of xylidines by peroxydisulphate ion - oxidation of 2,3-, 2,6- and 3,5 - xylidines	**Oxidn. Commun.**	***14*** (3), 196-202	**1991**
85	**Anil Kumar,** A. Henglein and H.	Photochemistry and radiation chemistry of semiconductor colloids - preparation of colloidal PbO_2 and various electron	**J. Phys. Chem.**	***93***, 2262-2266	**1989**

	Weller	transfer processes			
86	**Anil Kumar,** E. Janata and A. Henglein	Photochemistry of colloidal semiconductors - quenching of CdS fluorescence by excess positive holes	**J. Phys. Chem.**	***92***, 2587-2591	**1988**
87	A. Henglein, **Anil Kumar**, E. Janata and H. Weller	Photochemistry and radiation chemistry of semiconductor colloids - reaction of the hydrated electron with CdS and non-linear optical effects.	**Chem. Phys. Lett.**	***132***, 133-136	**1986**
88	**Anil Kumar**	Kinetics of oxidation of ethanolamine and diols by Ag (II).	**J. Phys. Chem.**	***86***, 1674-1678	**1982**
89	**Anil Kumar** and P. Neta	Reduction and demetalation of silver porphyrins in aqueous solution.	**J. Phys. Chem.**	***85***, 2830-2832	**1981**
90	**Anil Kumar**	Oxidative C-C bond cleavage of 1, 2-diols by Ag (II)	**J. Am. Chem. Soc.**	***103***, 5179-5182	**1981**
91	**Anil Kumar** and P. Neta	Complexation and oxidation of glycine and related compounds by Ag (II).	**J. Am. Chem. Soc.**	***102***, 7284-7289	**1980**
92	**Anil Kumar** and P. Neta	Oxidation of Ag^+ and Ag $(NH_3)_2^+$ complex as studied by pulse radiolysis.	**J. Phys. Chem.**	***83***, 3091-3095	**1979**
93	S.P. Srivastava, **Anil Kumar** and V.K. Gupta	Kinetics and mechanism of Ag^+ - catalysed oxidation of hexane-1,6-diol by peroxydisulphate ion.	**Rev. Roumaine de Chim.**	***26***, 939 - 946	**1981**
94	S.P. Srivastava, **Anil Kumar**, A.K. Mittal and V.K. Gupta	Kinetics and mechanism of Ag(I)-catalysed oxidation of pentane -1,5-diol by peroxydisulphate ion	**Oxidn. Commun.**	***1***, 265-273	**1981**
95	S.P. Srivastava, G. Bhattacha-	Kinetics and mechanism of periodate oxidation of salicylic acid.	**Indian J. Chem.**	***19A***, 578-579	**1980**

	rjee, **Anil Kumar** and S. Pal				
96	S.P. Srivastava, **Anil Kumar,** A.K. Mittal and V.K. Gupta	A kinetic study of peroxydisulphate oxidation of sulphadrugs - oxidation of sulphanilamide.	**Indian J. Chem.**	***17A***, 593 - 595	**1979**
97	J.C. Gupta, M.K. Mahe-shwari, S.P. Srivastava and **Anil Kumar**	Kinetics and mechanism of Ag^+ - catalysed oxidation of amyl alcohol, iso-amyl alcohol and crotylcohol by peroxydisulphate ion.	**Indian J. Chem.**	***18A***, 31-33	**1979**
98	S.P. Srivastava and **Anil Kumar**	Kinetics and mechanism of Ag^+ - catalysed oxidation of 1,4-butanediol by peroxydisulphate ion.	**Kinet. Catal.**	***19***, 1415-1418	**1978**
99	S.P. Srivastava, V.K. Mahesh, R. Sharma and **Anil Kumar**	Thin layer chromatography or some closely related physiologically active 2- benzoyl benzofuran deriavatives.	**Chem. Anal. (Warsaw)**	*23*, 837	**1978**
100	S.P. Srivastava and **Anil Kumar**	Ag^+ - catalyzedpresulphate oxidation products of 1,3-propanediol, 1-4-butanediol and 1,5-pentanediol.	**Indian J. Chem.**	***15B***, 967-968	**1977**
101	S.P. Srivastava and **Anil Kumar**	Kinetics of Ag^+ - catalysed oxidation of 1,3- propanediol by peroxydisulphate ion - a reinvestigation.	**Indian J. Chem.**	***15A***, 1114 - 1115	**1977**
102	S.P. Srivastava and **Anil Kumar**	Kinetics and mechanism of Ag^+ - catalysed oxidation of glycerol by peroxydisulphate ion - An analysis of consecutive reactions.	**Indian J. Chem.**	***15A***, 1061 - 1065	**1977**

103	S.P. Srivastava, R.N. Goyal, Rajeev Jain and **Anil Kumar**	Rapid TLC separation of some closely related coupled products of β-ketosester with aryldiazonium chlorides.	**Z. Anal. Chem.**	***286***, 248	**1977**
104	S.P. Srivastava, V.K. Dua and **Anil Kumar**	TLC separation of closely related diols.	**Z. Anal. Chem.**	***286***, 247	**1977**
105	S.P. Srivastava, H. Singh and **Anil Kumar**	Kinetics of silver catalysed oxidation of formamide by potassium peroxydisulphate.	**J. Indian Chem. Soc.**	***32***, 404 - 407	**1975**

(K). Major Innovative Achievements in Research – *In chronological Order*

(a). Analysis of the catalytic role of Ag^+ in initiating certain redox reactions

On this issue, in a series of papers, the species of silver were generated chemically, radiolytically and electrochemically and then investigated their reactions kinetically on early as well as longer time scales.[1-11] Initial work on this area was carried out at ***Rad. Lab., Univ. of Notre Dame***, ***USA*** in collaboration mainly with renowned Radiation Chemist, ***Prof. P. Neta***. These investigations led to resolve some ***long-debated issues*** on **catalytic role of Ag^+ in a number of redox reactions** in aqueous medium.

S.No.	***Reference***	***Citations****
1.	***Anil Kumar*** *and P. Neta,* ***J. Phys. Chem. 83, 3091-3095 (1979).***	***22***
2.	***Anil Kumar*** *and P. Neta,* ***J. Am. Chem. Soc.102, 7284-7289 (1980).***	***47***
3.	***Anil Kumar****,* ***J. Am. Chem. Soc. 103, 5179-5182 (1981).***	***23***
4.	***Anil Kumar*** *and P. Neta,* ***J. Phys. Chem. 85, 2830-2832 (1981).***	***27***
5.	***Anil Kumar****,* ***J. Phys. Chem. 86, 1674-1678 (1982).***	***23***
6.	***Anil Kumar*** *and A. Panwar,* ***Bull. Chem. Soc. (Japan) 67, 1207-1212 (1994).***	***08***
7.	***Anil Kumar*** *and A. Panwar,* ***Oxidn. Commun. 20, 258-266 (1997).***	***04***
8.	***Anil Kumar*** *and P. Kumar,* ***J. Phys. Org. Chem. 12, 79-85 (1999).***	***51***
9.	***Anil Kumar****, P. Kumar and P. Ramamurthy,* ***Polyhedron 18, 773-780 (1999).***	***128***
10.	***Anil Kumar,*** *Vaishali and P. Ramamurthy,* ***Int. J. Chem. Kinet., 32, 286-293 (2000).***	***82***
11.	***Anil Kumar,*** *Vaishali and P. Ramamurthy,* ***J Chem. Soc. Perkin Trans. 2*** **(7) 1174–1179 (2001).**	**02**

It also led us to realize the importance of **zero-valent Ag (*now known as Ag nanoparticles*) in catalysis** and led us to submit a proposal to DST, New Delhi in 1984 incorporating this and other literature ideas.

(b**). Initiation of Research in the Area of Nanoscience and Nanotechnology**

We had been among the **early workers, who have initiated work on nanomaterials in India**. In our first research proposal entitled. ***"Catalytic Action of Colloidal Microelectrodes in Photoinduced Chemical Reactions,***" submitted to DST, New Delhi in **1984**. The photocatalytic work using colloidal solution of metals and semiconductors as photocatalyst(s) was proposed. After it was sanctioned in **1985,** however, it could not be taken up as we got an offer from West Germany to collaborate with a **pioneering Radiation Chemist**, ***Prof. A. Henglein, Hahn-Meitner, Institut, Berlin as a Guest Scientist to*** carry out a research project in the related area.

(c). **Synthesis and Analysis of Optical Properties of Semiconductor NPs/QDs – Effect of chemically generated charge carriers on the charge dynamics**

In our early investigations with ***Prof. A. Henglein*** *at HMI, Berlin* on colloidal nanoparticles, the effect of chemically stored charge carriers on the **optical** and **photophysical** properties of some colloidal semiconductor NPs (**CdS** and **PbO_2**) was examined.[12-14] Such a situation is often encountered in studies on nanomaterials involving ***intense light sources like lasers and high energy radiation beam***. In the experiments with CdS NPs the excess electrons and holes were injected into the particles radiolytically / photolytically. It exhibited ***non-linear optical*** effect upon injection of electron (e_{aq}^-). The accompanied optical and emission changes were also monitored using **combined photo- and radiation chemical** techniques,[12,13] revealing an interesting dynamics of charge carriers in irradiated semiconductors.

S.No.	Reference	*Citations**
12	*A. Henglein,* ***Anil Kumar****, E. Janata and H. Weller,* ***Chem. Phys. Lett. 132, 133-136 (1986).***	***181***
13	***Anil Kumar****, E. Janata and A. Henglein,* ***J. Phys. Chem. 92, 2587-2591 (1988).***	***50***
14	***Anil Kumar****, A. Henglein and H. Weller,* ***J. Phys. Chem. 93, 2262-2266 (1989).***	***23***

(d). **Synthesis, Analysis and Enhancement of Physicochemical Features of Nanomaterials for Multifunctional Applications**

(i). Photocatalytic Action of Semiconductor Microelectrodes

In a subsequent work through a **DST project** awarded in 1989, colloidal particles of CdS semiconductor were employed as photocatalyst(s) in context of developing ***efficient solar energy conversion systems***.[15-19] The photogenerated electron-hole pairs were exploited to perform ***redox reactions*** *at the* ***interface of semiconductor nanocrystallites*** by using a variety of redox couples such as aromatic amines and indoles in aerated aqueous medium under ***visible light irradiation*** and carried out extensive mechanistic analysis involving the interfacial interactions and intermediates, which are very well cited.

S.No.	Reference	*Citations**
15	***Anil Kumar** and S. Kumar, **J. Photochem. Photobiol. A: Chem., 69, 91-95 (1992).***	***27***
16	***Anil Kumar** and S. Kumar, **J. Photochem. Photobiol. A: Chem., 83, 251-256 (1994).***	***19***
16	***Anil Kumar** and S. Kumar, **Chem. Lett., 711-712 (1996).***	***19***
18	***Anil Kumar**, S. Kumar and D.P.S. Negi, **J. Chem. Res. 1, 54-55 (1998).***	***03***
19	***Anil Kumar** and S. Kumar, **J. Phys. Org. Chem. 11, 277-282 (1998).***	***10***

2. Improvement in Photocatalytic Action and Charge Separation in Illuminated Surface Modified and Binary Semiconductor Components

In other DST project awarded in 1994, surface of these particles were modified chemicallyby coating with $Cd(OH)_2$ and coupling of two semiconducting components like **CdS-Ag_2S**,**CdS-TiO_2** were synthesized and identified by analyzing their characteristic absorption and emission, particle size, emission lifetime and redox reactivity.[20-27] Coating of **$Cd(OH)_2$ on Q-CdS** produced composite particles with enhanced photostability ($\Phi_{\text{-CdS}}$<0.002), luminescing efficiency and emission lifetime.[20-21] These particles were highly selective in initiating the photoinduced reactions of solutes like certain **indoles** and **nucleic bases**. Relaxation kinetics demonstrated that there is a distribution of charge carriers to various depths on the surface of $Cd(OH)_2$ - coated Q-CdS. Shallowly trapped hole affects the oxidation by intercepting the bulk solute *via* H-bonding interaction involving -OH of $Cd(OH)_2$ layer of CdS and certain functional group(s) of the additives. Deeply trapped hole remains inaccessible for the additives present either on the surface or in the bulk.

Doping of Ag^+ to Q-CdS generated ***microheterojunctions***consisting of CdS - Ag_2S phases and doping of metal ions to oxygenated TiO_2 suspensions also increased the reactivity of holes.[23] The coupling of **$Cd(OH)_2$ - coated Q-CdS** with **colloidal TiO_2** in aqueous medium removes Cd(OH)2 layer to form possibly [CdS–$TiO_2(OH)_2$],and the illumination of these composites under visible light improved the charge separation leading to the enhanced reactivity of e^--h^+ pair. The activation of both $Cd(OH)_2$ - coated Q-CdS and TiO_2 with certain transition metal ions and then coupling them with their respective non-activated component produces an efficient photocatalyst in certain cases.[24] The catalytic action of Ag^+ is understood in terms of the positive redox potential of Ag^+/ Ag couple, which serves to intercept the conduction band electron by reducing the e^- - h^+ recombination.

Nucleic bases were observed tostabilize Q-CdS clusters effectively. Their capping improved the **photocatalytic activity at the interface significantly.**[25-27] A few of these nanosystems could be recycled several times without any significant loss in reactivity.

Some research work addressing the **environmental issues** using TiO_2 suspensions in aqueous medium was also undertaken. Mechanisms of these reactions were analyzed,[28,29] which are largely accepted by readers.

S.No.	***Reference***	***Citations****
20	***Anil Kumar** and D.P.S. Negi, **J. Photochem. Photobiol. A: Chem**.134, 199-207(2000).*	***15***
21	***Anil Kumar** and D.P.S. Negi, **J. Colloid Interface Sci.** 238, 310-317 (2001).*	***12***

22	***Anil Kumar** and A.K. Jain, **J. Mol. Catal. A: Chem.** 165, 267-275 (2001).*	***102***
23	***Anil Kumar** and A.K. Jain, **J. Photochem. Photobiol. A: Chem.** 156, 207-218 (2003).*	***27***
24	***Anil Kumar** and S. Mital, **J. Colloid Interface Sci.** 240, 459-466 (2001).*	***18***
25	***Anil Kumar** and S. Mital, **Photochem. Photobiol. Sci. (commun.)** 1, 737-41 (2002).*	***14***
26	***Anil Kumar** and S. Mital, **J. Colloid Interface Sci.** 265, 432-438 (2003).*	***09***
27	***Anil Kumar** and S. Mital, **Int. J. Photoenerg.** 6(2), 61-68 (2004).*	***13***
28	***Anil Kumar** and N. Mathur, **J. Colloid Interface Sci.** 300, 244-252 (2006).*	***126***
29	***Anil Kumar** and S. Mathur, **Appl. Catal. A: Gen.** 275,189-197 (2004).*	***73***

(iii). Enhancement of Electronic Properties and Photophysics of Quantized II-IV and IV-VI Semiconductors

An interesting **achievement** was made by carrying out **bio-molecule(s) mediated synthesis of II-VI** and **IV-VI semiconductor nanostructures in quantum-confined region.**[30-43] In a DST project funded under nanomission, interfacing of Q-ZnS with PbS and Q-PbS with ZnS has been utilized to produce tailored PbS nanocomposites with tuneable electronic properties.[30] The separation of charge is enhanced in case of PbS/ZnS core-shell particles. The deposition of Q-ZnS layer as shell at the interface of Q-ZnS/PbS produces ZnS/PbS/ZnS nanocomposites.[31,32] The addition of Zn^{2+} further improves the charge separation in this system.

In our original work published in **Langmuir (letter)**, **RNA-capped Q-PbS**[33] were produced in face centered cubic phase, which displayed excitonic features with relatively a strong narrow emission band (FWHM 70 nm) at **675 nm** under broad excitation range extending from 330 to 620 nm. In the presence of Zn^{2+} these particles produced fluorescent **Zn/PbS (PbS+ Zn^{2+}) supernanostructures**.[31] We also demonstrated the nucleation and growth of templating **Q-CdS NPs,[32] CdS/ZnS nanotubes[35] to create novel nano- and micro assemblies.** In other interesting work we have fabricated **GMP-mediatednanowires**[34] with increased separation of charge. We had also synthesized fluorescing CdSe nanostructures,[42,43] and exhibited rectifying behaviour. These nanohybrids were exploited for sensing of toxic metal ions like Hg^{2+} up to 100 pm.[43]

Lately we have succeeded in the synthesis of **dual fluorescing PbSe nanostructures** having a wide absorption range covering UV-visible-NIR region (200–1200 nm) of varied morphologies.[36-42] The excess metal ions such as **Mg^{2+}**,[41] and **Zn^{2+}** [38] present on the RNA strand **induces polarization** in the PbSe through Se to result in varied supramolecular interactions by replacing Pb^{2+} among different building blocks to produce ***porous and honeycomb like morphologies*** in the process of self-assembly. The **poor NIR absorption** and **fairly intense fluorescence** in the wavelength range of ***850–1100 nm*** of the as synthesized PbSe nanohybrids and relatively higher red (~300 ns), and NIR lifetime (31.8 ns) as compared to those of organic fluorescent dyes (<1.5 ns) shows the potential of these materials to serve **as an effective tool for the fluorescence imaging of body fluids and tissues in the NIR region, where tissues do not absorb.**

From this work we have **established** that the **specific RNA sequence is not required for mediating the synthesis of fluorescing II-VI (CdS, ZnS, CdSe)** and **IV-VI semiconducting nanostructures.** Apart from that their **growth** and **change in morphologies,** their **optoelectronic**

behaviour could be **controlled quite effectively.** Lately, their **sensing** applications are being performed.[41-43] We have recently developed ***widely explored intense white emission*** from ***CdSe based nanostructures***.[44]

We have also contributed a review article on **biotemplated inorganic nanostructures** published in ***Chemical Reviews*** comprising semiconductor(s)/metal(s) nanosystems mediated by nucleic acids and their optical, photophysical and magnetic properties.[45] This review is well cited.

Some work was also contributed on bare Fe and Mn doped CuO semiconducting nanostructures[46,47] of varied morphologies and observed their **enhanced optical, magnetic, ferroelectric and dielectric behavior.**

S.No.	***Reference***	***Citations****
30	***Anil Kumar** and A. Jakhmola, **J. Colloid Interface Sci. 297, 607-617 (2006)**.*	***23***
31	***Anil Kumar** and A. Jakhmola, **J. Phys. Chem. (C), 112, 3633-3640 (2009).***	***13***
32	***Anil Kumar**, A. Jakhmola and V. Chaudhary, **J. Photochem. Photobiol A: Chem 208, 195- 202 (2009).***	***13***
33	***Anil Kumar** and A. Jakhmola, **Langmuir (Lett.), 23, 2915-2918 (2007).***	***81***
34	***Anil Kumar** and V. Kumar, **J. Phys. Chem. (C), 112, 3633-3640 (2008).***	***27***
35	***Anil Kumar** and V. Kumar, **Inorg. Chem., 48, 11032-11037 (2009).***	***15***
36	***Anil Kumar** and V. Kumar, **Chem. Commun., 5433-5435 (2009).***	***05***
37	***Anil Kumar** and B. Singh, **Chem. Commun., 47 (14), 4144 - 4146 (2011).***	***15***
38	***Anil Kumar** and B. Singh, **Dalton Trans., 42, 11455–11464 (2013).***	***09***
39	***Anil Kumar** and B. Singh, **J. Phys. Chem. (C), 117, 5386–5396 (2013).***	***08***
40	***Anil Kumar**, B. Singh and K. Gupta, **J. Phys. Chem. (C), 119, 6314-6323 (2015).***	***-***
41	***Anil Kumar** and B. Singh, **RSC Advances, 2, 9079–9090 (2012).***	***05***
42	***Anil Kumar** and K. Gupta, **J. Mater. Chem. (A), 5, 6146-6163 (2017).***	***14***
43	***Anil Kumar** and K. Gupta, **J. Phys. Chem. (C), 122, 7898−7915 (2018).***	***01***
44	***Anil Kumar** and K. Gupta, **J. Mater. Chem. (C), 7, 692-708 (2019). DOI: 10.1039/c8tc05560b***	***-***
45	***Anil Kumar** and V. Kumar, **Chem. Rev. 114, 7044-7078 (2014).***	***74***
46	Umesh Kumar Gaur, **Anil Kumar** and G. D. Varma ***CrystEngComm (RSC), 16, 3005–3014 (2014).***	***26***
47	Umesh Kumar Gaur, **Anil Kumar** and G. D. Varma, ***J. Mater. Chem. C, 3, 4297- 4307 (2015).***	***26***

(iv). Mechanistic Analysis of Charge Separation Dynamics and Photophysics of Metal-Semiconductor binary Nanohybrids

In **Ag/CdS** nanocomposites the content of Ag was noted to modify the nature of surface interaction between the two components by influencing the emission behavior and charge carrier dynamics in a complex scheme.[48,49] At low molar ratio of Ag:CdS an enhancement in fluorescence is observed which has been attributed to the excited state charge transfer interaction between the two components. Relaxation kinetics of charge carriers of CdS also revealed the formation of **transitory CT complex** between excited CdS and Ag, in which the extent of electron transfer is controlled by the amount of Ag. With biotemplated Ag/CdS nanocomposites[48-50] an enhancement in the intensity of

emission of bare CdS was observed by about 7 folds associated with an increase in the separation of charge. This **mechanism,** proposed for the first time, is well cited.

S.No.	***Reference***	***Citations****
48	***Anil Kumar** and V. Chaudhary, **J. Photochem. Photobiol. A: Chem. 189, 272-279 (2007).***	***29***
49	***Anil Kumar** and V. Chaudhary, **Nanotechnology, 20, 095703 - 095712 (2009).***	***18***
50	***Anil Kumar,** V. Chaudhary and V. Kumar, **Eur. J. Inorg. Chem., 269-279 (2013).***	***01***

(e). **Iron Oxide Based Nanosystems for Multifunctional Applications**

(v). Development of Iron Oxide based Nanostructures and Nanohybrids

Iron oxide based magnetic nanostructures due to their wide ranging multi-disciplinary applications are being considered to be important being environmentally benign, biocompatible and cost effective. In a CSIR sponsored project we have developed several **iron oxide based nanosystems** in **beta phase** in different morphologies exhibiting superparamagnetic behavior.[51-54] For the first time silver iron oxide (**$AgFeO_2$**) NPs[51] in β- phase depicted a narrow size distribution and the water soluble core-shell nanostructures consisting of colloidal Ag in the core and iron oxide hollow nanotubes in the shell.[52] The **binary** and **ternary nanohybrids** of iron oxide with other semiconducting (CdS) and metal (Ag) NPs[53] have also been synthesized and analyzed the dynamics of charge carriers in the irradiated systems.

S.No.	***Reference***	***Citations****
51	***Anil Kumar** and A. Singhal, **Nanotechnology, 18, 475703 (2007).***	***47***
52	***Anil Kumar** and A. Singhal, **Nanotechnology, 20, 295606-295616 (2009).***	***19***
53	***Anil Kumar** and A. Singhal, **Mater. Chem. Phys. 131, 230-240 (2011).***	***14***
54	***Anil Kumar** and A. Singhal, **J. Mater. Chem., 21, 481-496 (2011).***	***17***

(vi). Biotemplated colloidal β–FeOOHNanohybrids & Hydrogels – their Formation, Loading and Release Capabilities

In other project biotemplated colloidal β–FeOOH nanostructures were synthesized by the hydrolysis of $FeCl_3$ using adenine,[55] 5'–AMP[56] and 5'–GMP[57] biomolecules as template(s). In these nanostructures, β–FeOOH displays enhanced optical and magnetic features as compared to that of bare β–FeOOH, which are fairly different to those of α–Fe_2O_3, β–Fe_2O_3, γ–Fe_2O_3, Fe_3O_4 and γ–FeOOH. Bare β–FeOOH exhibits the formation of nanorods, whereas, in the presence of biotemplates, it showed the biomolecule dependent change(s) in the morphology by converting nanorods to quantum dots. The extent of interaction of biomolecule with Fe^{3+} controlled this conversion and follows the order: ***5'–AMP > 5'–GMP > adenine***. These templates have also been found to form **hydrogels with β–FeOOH**. In view of the template like ***5'-GMP / 5'-AMP*** and β-FeOOH being biocompatible and the **hydrogels** being **superparamagnetic**, we have explored their **viscoelastic properties, loading and release capabilities** in the context of their possible biomedical applications.[58] In our recent work we have achieved remarkable success in developing hitherto unreported ***5'–CMP molecule based smart hydrogels.***[59-61] The high porosity, surface area, % swelling, and loading and release performance of the hydrogel indicate its potential for drug delivery and other biological / biomedical applications.

S.No.	Reference	Citations*
55	***Anil Kumar** and S. K. Gupta, **J. Nanopart. Res., 15:1466, 1-16 (2013) (DOI 10.1007/s11051-013-1466-z).***	***17***
56	***Anil Kumar** and S. K. Gupta**, Green Chem., 17, 2524–2537 (2015).***	***25***
57	***Anil Kumar** and S. K. Gupta**, J. Mater. Chem. (B), 1, 5818-5830 (2013).***	***18***
58	***Anil Kumar** and S. K. Gupta, **J. Phys. Chem. (B), 118, 10543-10551 (2014).***	***15***
59	***Anil Kumar** and Priyanka, **New J. Chem. 43, 14497-15013 (2019).***	***14***
60	*Priyanka and **Anil Kumar, ACS Omega, 5, 13672–13684 (2020).***	***12***
61	*Priyanka and **Anil Kumar, Dalton Trans. 49, 15095-15108 (2020).***	***04***

(vii). Greener Protocols for gamma Iron Oxide (γ-Fe_2O_3) based Nanosystems - their SERS, Biological and Catalytic Applications

Some nanocomposites/nanohybrids of iron oxide like glucose-mediated and chitosan-mediated silver coated **γ-Fe_2O_3** like **Ag–γ-Fe_2O_3**[60] and **Ag–γ-Fe_2O_3@Cs**[61,62] have been explored for their **catalytic, SERS** and **antibacterial activities** using the model dye(s) and bacteria, respectively. The superparamagnetic behavior of as synthesized binary nanocomposites at room temperature with high value of **saturation magnetization** makes them highly suitable for usage as catalyst, allowing their convenient recyclability. All the components of the as-synthesized nanocomposite(s) being biocompatible, environmentally benign, demonstrating effective catalytic, SERS and antibacterial activities qualify them as a **greener nanosystems(s)** with **multifunctional applications.** The catalytic reduction of certain dyes investigated kinetically at their interface followed Langmuir-Hinshelwood's mechanism. Further work on these nanosystems is in progress.

S.No.	Reference	Citations*
60	M. Kaloti, **Anil Kumar** and N. Navani, ***Green Chem., 17, 4786-4799 (2015).***	***40***
61	M. Kaloti, and **Anil Kumar, *J. Phys. Chem. C 120, 17627-17644 (2016).***	***43***
62	M. Kaloti, and **Anil Kumar, *ACS Omega, 3 (2), 1529–1545 (2018).***	***32***

(viii). Greener Protocols for Synthesis of Reduced Graphene Oxide (rGO) – Supercapacitor and SERS Applications

We have synthesized **ultra-thin**[63] **and a few layer(s) thick N-functionalized graphene sheets**[64-67]employing **mild/environmentally friendly reducing agents** for the effective reduction of GO under **mild experimental conditions** in **aqueous medium**. The higher nucleophilicity of the malonic acid is observed to be more effective for the **efficient reduction of GO** to produce thin graphene sheets. The judicious control of pH of the reaction mixture brings a change in the morphology of graphene into **nanoribbons**[68] involving supramolecular interactions among the residual functionalities of reduced GO and malonic acid besides controlling the ***nucleophilicity*** of the later. The changed morphology of graphene exhibit improved characteristic features for the **high performance supercapacitor applications.**[68] The functionalization of N-doped graphene (GRH-Gly) with Ag NPs further enhanced the multifunctional features as regards to its conductivity, surface area and **SERS**.[68] ***In the recent past,*** we have succeeded in ***extending the potential window of symmetric supercapacitor to fairly high value of 2.5 V*** with significantly ***higher energy density*** at ***power density using salt-in-water (neutral) electrolyte***.[69] These systems are found to have relatively **better conducting behaviour** with high value of **specific capacitance** at higher **current densities**, exhibiting potential for **supercapacitor**

applications.[62-68] Water-in-Salt like electrolyte enhance the cell voltage to 2.7 V.[70-71] Further work on making devices using ***environmentally benign materials***, ***electrolytic components*** and ***protocols*** is in progress. A patent on enhanced features of these materials has been granted. Lately, we have developed Mn_3O_4 nanocube-decorated N-rGO nanosheets, as Mn_3O_4 is considered to be environmentally compatible with high specific capacitance, and high oxygen evolution potential. It exhibited the cell potential of 2.7 V with superior electrochemical features.[72] In a remarkable breakthrough, we could enhance the ***cell voltage of a symmetric supercapacitor up to 3.0 V*** and also achieved excellent electrochemical features.[73-75] Further work on these system is in progress.

We have lately also developed γ-Fe_2O_3-rGO-based nanohybrids for energy efficient selective humidity[76] and NO_2 gas sensors.[77]

S.No.	***Reference***	***Citations****
63	**Anil Kumar** and M. Khandelwal, **J. Mater. Chem. (A), A, 2, 20345–20357 (2014).**	***35***
64	**Anil Kumar** and M. Khandelwal, ***New J. Chem., 38, 3457-3467 (2014).***	***80***
65	M. Khandelwal and **Anil Kumar**, ***Advanced Materials Proceedings 1, 08-13 (2016).***	***-***
66	M. Khandelwal and **Anil Kumar**, ***New J. Chem., 41, 8333-8340 (2017).***	***17***
67	M. Khandelwal and **Anil Kumar**, ***J. Mater. Chem. (A), 3, 22975-22988 (2015).***	***90***
68	M. Khandelwal and **Anil Kumar**, ***Dalton Trans., 45, 5180-5195 (2016).***	***40***
69	S. Thareja and **Anil Kumar**, ***Energy Technol., 1901339 (2020).***	***28***
70	S. Thareja and **Anil Kumar**, ***ACS Sustainable Chem. Engg., 9, 2338-2347 (2021).***	***46***
71	S. Thareja and **Anil Kumar**, ***J. Phys. Chem. C, 125, 24837-24848 (2021).***	***24***
72	S. Thareja and **Anil Kumar**, ***Energy & Fuels, 36, 15177-15187 (2022).***	***10***
73	I. Ahmad and **Anil Kumar**, ***Sustain. Energy & Fuels, 6, 4169-4182 (2022).***	***04***
74	I. Ahmad and **Anil Kumar**, ***Chem. Engg. J., 477, 146972 (1-12) (2023).***	***10***
75	I. Ahmad and **Anil Kumar**, ***Adv. Sustain. Syst, DOI:10.1002/adsu. 202400174 (1-13).***	***02***
76	A. Kumar, **Anil Kumar** and G.D Varma, ***J. Mater. Chem. C*, 9, 8002–8010 (2021).**	***17***
77	A. Kumar, **Anil Kumar** and G.D Varma, ***New Journal of Chemistry 47 (NJ047010), 4871-4879***	***05***

***Note -** The citations shown above are as per Google Scholar Data including Self-citations.

In summary, we have made several innovative contributions to the research in the area of ***Physical Chemistry*** covering wide ranging topics on ***Nanotechnology Related Research, Chemical Kinetics***, ***Photochemistry/ Radiation chemistry***.

(M). Details of M.Tech. /M. Phil. Supervised (21):

S. No.	**Name of the Student Name of the Supervisor(s) Year**	**Title of Dissertation**
1.	**Avdesh Kumar** Prof. Anil Kumar	Synthesis of Glucose Mediated Ag/ZnO Nanocomposites and a Study of Their Optical Properties

	2014	
2.	**Harsh Kumar** Prof. Anil Kumar 2013	Synthesis of PVP Stabilized Silver Nanostructures and Study of Their Physical and Biological Properties
3.	**Neetu Yadav** Prof. Anil Kumar 2013	Synthesis of Cystein-Coated-Ferrite Nanoparticles- Study of Adsorption of Certain Hazardous Metal Ions on Their Surface
4.	**Kanchan Yadav** Prof. Anil Kumar 2012	Syntheis of Upconverting $NaGdF_4$: Tm^{3+}/Yb^{3+} Nanoparticles- Study of Their Biocompatible Surface Modification
5.	**Queeny Dasgupta** Prof. Anil Kumar 2012	Synthesis of Biotemplated Fluorescent Silver Nanostructures and Their Physicochemical Properties
6.	**Anuj Kumar** Prof. Anil Kumar 2011	Synthesis and Characterization of Ag-supported Hydroxylapatite γ-Fe_2O_3 Nanocomposites (AgHAP- γ-Fe_2O_3)
7.	**Linu M** Prof. Anil Kumar 2011	Synthesis of Surface-Modified Superparamagnetic Iron Oxide Nanocomposites
8.	**Shaik Firdoz** Prof. Anil Kumar 2010	Synthesis of Metal Oxide Nanoparticles and Their Inhibitory Action for Glycoside Hydrolases
9.	**Ashutosh Agarwal** Prof. Anil Kumar Prof. Himanshu Joshi 2009	Synthesis, Characterization and Application of Nanoparticles in Water Remediation
10.	**Santi Prasad Chakrabarti** Prof. Anil Kumar Prof. R. Nath 2004	Study of Physical and Electrical Properties of Ferric Oxide Nanoparticles
11.	**Neeru Gupta** Prof. Anil Kumar 2003	Physicochemical Properties of Metal Sols
12.	**Lallan Singh Yadav** Prof. Anil Kumar 2001	Development of TiO_2 Supported Rigid Material- Study of Their Photocatalytic Activity
13.	**Anshuman Jakhmola** Prof. Anil Kumar 2000	Photocatalytic Redox Reactions of Certain Organics Intiated by TiO_2 Suspensions
14.	**Tapan Bhatnagar** Prof. Anil Kumar 1999	Analysis of Photocatalytic Behaviour of TiO_2 Suspension in Aqueous Medium for Certain Redox Couple(s)
15.	**Jagat Singh** Prof. Anil Kumar 1998	Photooxidation of Certain Organics Using TiO_2 suspension as catalyst
16.	**Kuldeep Singh Bhandari** Prof. Anil Kumar 1995	Study of Ruthenium (II) Tris(Bipyridyl) – Sensitized Photochemical Reaction of Indole – Effect of Certain Semiconductors on the Mechanism of the Reaction
17.	**Lalit Mohan Singh Negi** Prof. Anil Kumar 1995	Study of Cadmium Sulphide- Induced Photochemical Reaction of 2,3- Dimethyl Indole

18.	**Ranjana Uniyal** Prof. Anil Kumar 1993	Photosensitized Reaction of Aniline Using Mixed and co-Colloids Catalysis of Zinc Sulfide and Cadmium Sulfide
19.	**Nidhi Bharti** Prof. Anil Kumar 1992	Photosensitized decomposition of 1-Naphtylamine Using Visible Light Radiation
20.	**Raksha Gupta** Prof. Anil Kumar 1991	Photochemical Treatment of Industrial Coal Wastes-Photodecomposition of Indole
21.	**Anita Agarwal** Prof. Anil Kumar 1990	Separation and Quantization ofHalophenols and Related Compound by Gas Chromatography

(N). Details of M.Sc. Project supervised (40):

S. No.	**Name of the Student** Name of the Supervisor(s) Year	**Title of Project**
1.	**Rajesh Prasad Verma** Prof. Anil Kumar 2022	Synthesis of Sulphur-Doped Reduced Graphene Oxide – Its Electrochemical Characterization and Sensing of Mercury (II) Ions on Its Surface
2.	**Akash** Prof. Anil Kumar 2022	Synthesis of Phosphorous-Doped Reduced Graphene Oxide – Its Electrochemical Characterization and Sensing of Dopamine and Uric Acid on Its Surface
3.	**Vikas Yadav** Prof. Anil Kumar 2021	Synthesis of Activated Carbon Material Derived From Eucalyptus Leaves and Their Electrochemical Applications.
4.	**Priyanka** Prof. Anil Kumar 2021	Synthesis of Tryptophan-Mediated Hydrogels and Their Applications
5.	**Charchita Gautam** Prof. Anil Kumar 2020	Synthesis of Carboxymethyl Cellulose and 5'-Adenosine Monophosphate-Mediated Supramolecular Porous Hydrogels Doped With Zn^{2+} Ion and Silver Nanoparticles
6.	**Naveen Ojha** Prof. Anil Kumar 2020	Reduction And Functionalization of Graphene Oxide Employing Thiamine Hydrochloride as A Reducing Agent - Synthesis of N and S-Doped Reduced Graphene Oxide
7.	**Sumit Kumar Yadav** Prof. Anil Kumar 2019	Synthesis and Characterization of Cysteine-Capped MnS Nanoparticles – an Analysis of their Photophysical Behavior
8.	**Narendra Kumar Yadav** Prof. Anil Kumar 2019	Synthesis and Characterization of γ– Fe_2O_3 Nanoparticles using Aloevera as a Capping Agent – Analysis of its Photocatalytic Activity
9.	**Parveen** Prof. Anil Kumar 2018	Synthesis and Characterization of Fe_3O_4-SiO2-ZnONanocomposites - Study of Adsorption and Photocatalytic Activity for Methylene Blue Degradation

10.	**Arun Garg** Prof. Anil Kumar 2017	Synthesis and Characterization of β-Cyclodextrin Coated Fe_3O_4 Nanoparticles and Study of their Surface and Photocatalytic Behavior
11.	**Sanjana** Prof. Anil Kumar 2016	Synthesis of PVA-Coated Zerovalent Iron Nanoparticles and Study of their Catalytic Activity fopr the Reduction of 4-Nitrophenol.
12.	**Kriti Seth** Prof. Anil Kumar 2015	Synthesis of MCM-41 – Its Use as a Support for the Preparation of CdS Nanoparticles
13.	**Sneha Paul** Prof. Anil Kumar 2014	Synthesis and Characterization of Polyvinyl Alcohol Coated γ– Fe_2O_3 Nanoparticles
14.	**Moni Kumari Gupta** Prof. Anil Kumar 2012 ***(M.Sc. Integrated)***	Synthesis of Nanohydroxyapetite- A Study of Its Interaction with Elastin
15.	**Venkatesh Tunuguntla** Dr. Anil Kumar 2010	Synthesis and Characterization of Manganese Ferrite Nanoparticles by Non- Hydrolytic Sol- Gel Process
16.	**Pankaj Kumar Choubey** Dr. Anil Kumar 2008	Microwave Assisted Synthesis of Zinc Oxide Nanoparticles.
17.	**Dibyendu Kumar Das** Dr. Anil Kumar 2007	Synthesis and Characterization of TiO_2 Nanoparticles
18.	**Debashree Das** Dr. Anil Kumar 2005	HPLC Analysis of Some Fullerenes in Carbon Soot
19.	**Aarti** Dr. Anil Kumar 2004	Synthesis and Physicochemical Properties of Colloidal Iron Oxide
20.	**Mohammad Ilyas** Dr. Anil Kumar 2003	Kinetics of Oxidation of Tartaric Acid by Diperiodatoargentate (III) Ion
21.	**Amar Deep** Prof. Anil Kumar 2002	Kinetics of Oxidation of Benzyl Alcohol by Diperiodato- Argentate (III) Ion
22.	**Ila Dharmsaktu** Dr. Anil Kumar 2002	Photophysical Properties of Lead Sulphide Particles
23.	**Arvind Kumar Gejwal** Dr. Anil Kumar 2001	Kinetics of Oxidation of N- Propylamine byDiperiodato- Argentate (III) Ion
24.	**Virendra singh** Dr. Anil Kumar 2000	HPLC Separation of Certain Purines, Pyrimidines and Tryptophan
25.	**Vijender Kumar** Prof. Anil Kumar 1999	Kinetics of Oxidation of Acetone byDiperiodato- Argentate (III) Ion
26.	**Sanjeev Sharma** Prof. Anil Kumar 1998	Effect of Doping of Doping of Fe^{2+} and Fe^{3+} on the Photocatalytic Activity of TiO_2 for the Oxidation of 1,2- Ethanediol

27.	**Amit Kaushik** Prof. Anil Kumar 1997	Colloidal CdS- Sensitized Photochemical Reaction of Indole-3-Acetic Acid
28.	**Minakshi Verma** Dr. Anil Kumar 1997	Kinetics of Oxidation of Succinic Acid by DiperiodatoArgentate (III)
29.	**Sanjay Gupta** Prof. Anil Kumar 1996	Chromatographic Separation of Indoles and related compounds
30.	**Charu Arora** Prof. Anil Kumar 1995	Kinetics of Oxidation of Alcohols by Bis (Periodato) Argentate (III)
31.	**SuchetaSangawar** Prof. Anil Kumar 1994	Synthesis of Composite Semiconductor (CdS/PhS) Particles and Study of their Physical Properties
32.	**Alok Gupta** Prof. Anil Kumar 1993	Reaction of Tetrahydroxoargentate (III) Ion with 1-Napthylamine.
33.	**A.S.R. Prasad** Prof. Anil Kumar 1993	Light Induced Reactions of 1-Napthylamine Using Cadmium Sulphide as a Photocatalyst
34.	**Anurag Kumar Bhatnagar** Dr. Anil Kumar 1992	Synthesis and Photochemical Behaviour of Silver (II) Phenanthroline Complexes.
35.	**Vivek Kumar** Prof. Anil Kumar 1991	Study of Photoluminescence Property of Cadmium Sulphide in Presence of Aromatic Amines and their Photocatalytic Reactions
36.	**MeherBala Lalit** Prof. Anil Kumar 1990	Effect on Photoluminescence of Zinc Sulphide by Different Metal Ions
37.	**Anumolu Anand Kumar** Prof. Anil Kumar 1989	Mechanism of Reaction of Ag (III) Species With Some Organics
38.	**Archana** Prof. Anil Kumar 1989	Separation of Aromatic Amines Phenols and Related Compounds by HPLC
39.	**Prasanna Kumary M.N.** Prof. Anil Kumar 1985	The Redox Reactions and Stabilisation of Unusual Valency States of Metal
40.	**Arunan. K.** Prof. Anil Kumar 1984	Physico- Chemical Studies of Few Transitions Metal Complexes

(O). **Summary of Research Contribution**:

I have been among the early contributors ***on*** *Nanoscience/Nanotechnology* in ***India***, ***who has initiated research in this area,*** as is also evidenced from our published research work/presentations/proposals submitted to DST, New Delhi. Our first research project on these systems was sanctioned as early as in 1985 by DST *vide letter* D.O. No. 23(1P-20)/84 dated Dec. 10,

1985, but could not be taken up at that time as I received an offer to join as a Guest Scientist at Hahn-Meitner-Institut, Germany with pioneering Radiation Chemist, Prof. A. Henglein on radiation chemical aspects of colloidal nanomaterials and worked there till 1988. Thereafter, we initiated work on synthesis and photochemistry of metal and semiconductor nanosystems at IIT Roorkee mainly through **projects** funded by the **DST**, New Delhi.

Our research work on these as well as earlier systems was recognized by ***The National Academy of Sciences, Allahabad, India*** and was **Elected as Fellow** of this prestigious academy in 2003.

The 2023 Nobel Prize in Chemistry was awarded to: Moungi G. Bawendi, Louis E. Brus and Aleksey Yekimov for their ***"Discovery and Synthesis of Quantum Dots"*** involving their work on ***colloidal nanoparticles*** (NPs). Brus's work on colloidal CdS nanoparticles was published in 1982. It is heartening to mention that we were also involved on similar colloidal nanoparticles since mid nineteen eighties and was embodied in our proposal submitted to DST, New Delhi in 1984. ***Our very first papers contributed in this area in 1986 and, thereafter, in a series of papers involved colloidal CdS nanoparticles.*** We have published several research papers and supervised Ph.D. thesis on the colloidal NPs investigated by Prof. L.E. Brus and Prof. Moungi G. Bawendi.

Over the years, we have ***addressed a number of issues pertaining to research*** on ***nanomaterials*** and contributed immensely to their synthetic protocols, physicochemical properties and applications. Apart from these, I have been instrumental at IIT Roorkee in establishing a ***Centre of Excellence–Nanotechnology*** and also introduced a ***new teaching program - M.Tech. (Nanotechnology)***. This is still running successfully.

Lately, increasing environmental issues have necessitated developing newer materials following ***greener protocols.*** In this context, during last one and a half decade our research has focused on developing ***greener/biocompatible nanohybrids*** and integrated nanostructures with ***enhanced multifunctional features***, addressing some ***environmental issues***. Specifically, biopolymers and their components/ other biocompatible molecules have provided the ***novel capping agent(s)*** for growing different greener nanohybrids of semiconductors (II-VI/IV-VI /iron oxide(s)/oxyhydroxide(s) semiconductors/metal(s)) with ***1D / 2D / 3D / porous nano-architectures***. These researches include ***semiconductor(s)/metal(s) and their nanohybrids with excellent photophysical/ photochemical, catalytic behavior*** as well as designing of ***smart hydrogels.***

In recent years, we have fabricated some newer electrode materials, *viz.* ***ultra-thin / a few layer(s) thick N-functionalized reduced graphene oxide (rGO) sheets***, ***nanoribbons,*** and ***Ag-coated rGO,*** employing **mild/environmental friendly** *reducing agents* for the reduction of GO in ***aqueous medium*** for devising efficient supercapacitors. Lately, we have succeeded in ***extending the potential window of symmetric supercapacitor*** *to* ***fairly high value of 2.5 V*** with significantly ***high energy***

density@power density in salt in water like electrolytes. These systems exhibited ***better conductivity*** with fairly high value of ***specific capacitance*** *at higher* ***current densities***. This work has been ***identified*** by the prestigious **Confederation of Indian Industry (CII)** among the **innovations from IIT Roorkee during 2021.**We also got one patent granted in 2022 on the related work. In "Water-in-Salt" like electrolyte(s) the cell voltage has further been enhanced to ***remarkably high value*** *to* ***3.0 V***. A patent on enhanced features of these materials has been granted this year in March 24.

Most of our work in the area of nanoscience/nanotechnology is published in ***International Journals*** *of repute* with an ***average impact factor*** of ***~6*** indicating the ***importance of our work in the context of current scientific importance.*** Among ***24 Ph.D.*** students supervised so far, ***20 students have carried out their research on nanosystems.***

In our ongoing research, we aim to develop innovative ***functionalized greener nanostructures*** as electrode material(s) and optimization of their electrochemical performance in ***aqueous electrolyte(s)*** to fabricate ***high-voltage*** supercapacitor to act as ***efficient energy storage device(s).*** Besides, being ***environmentally benign*** and functionalized, these nanohybrids are also expected to be suitable for ***selective electrochemical sensing*** with ***lower limit of detection, hydrogen storage*** and ***electro-catalytic*** applications.