

Name: Dr. Rakesh Kumar

Designation: Assistant Professor

Centre: Centre for Chemical Sciences

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Education

- **2012-PhD (Organic Chemistry)**
PhD Thesis entitled "**Green Synthesis of Bioactive Phenolics Employing Ionic Liquids and Microwave Assisted Approaches**" from the CSIR-IHBT, Palampur (H.P.) and registered at Deptt. of Chemistry GNDU, Amritsar, India (under MoU between CSIR-IHBT, Palampur and GNDU, Amritsar).
- **2005-MSc (Chemistry)**- Maharishi Dayanand Sarswati University, Ajmer (Raj.).
- **2002-BSc BEd (Four Year Integrated Course by NCERT)**- Regional Institute of Education Ajmer.
- **1998-12th**- Blue Star Pub. Sr. Sec. School Hamirpur (Himachal Pradesh Board of School Education, Dharamshala).

Experience

- **Assistant Professor (July 2015-Present):**
Centre for Chemical Sciences, Central University of Punjab, Bathinda.
- **DST Young Scientist (Dec. 2014-July 2015):**
Central University of Punjab, Bathinda. Worked on a project sponsored by Department of Science and Technology (DST) under Fast Track Scheme for Young Scientists.
- **Assistant Professor (July 2013-Nov. 2014):**
Department of Chemistry & Biochemistry, College of Basic Sciences, CSK-HPKV, Palampur (H.P), India. Taught Organic and Inorganic Chemistry courses at UG level.
- **Postdoctoral Research Fellow (Feb.2012-Feb. 2013):**
Laboratory for Organic & Microwave-Assisted Chemistry (LOMAC), University of Leuven (KU Leuven), Belgium. Worked on the development of novel strategies for the construction of bioactive compounds like cyclic guanidines and benzodiazepene scaffolds.
- **Senior Research Fellow (April 2008-March 2011):**
CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur, India. Explored the synthesis of a series of bioactive phenolics from abundantly available natural phenylpropenes such as β -asarone (a toxic *cis*-phenylpropene in *Acorus calamus* oil) besides the development of transition metal-catalyzed coupling strategies.
- **Junior Research Fellow (March 2006-March 2008):**
CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur, India. Worked on the developed various alternative green methodologies utilizing microwave, ionic liquids and aqueous media reactions.

Teaching Assignments

Advanced Organic Chemistry

Spectral Analysis

Logics of Organic Synthesis

Research Project

Handled

Ongoing

“Direct C-H bond functionalization of heteroarenes via dehydrative and dehydrogenative coupling strategies” sponsored by Department of Science and Technology (DST), Govt. Of India, under **Fast Track Scheme** for Young Scientists-**22 Lakhs**

Professional Recognition /Awards/Scholarship

- **DST-Young Scientist** award under Fast Track Scheme.
- **Dr. P.D. Sethi Annual Award-2012**, for Best Research Paper (*Angew. Chem. Int. Ed.* 2012, 51, 2636) on Application of HPTLC/TLC in Pharma, Herbal, and Other Chemical Analysis.
- Qualified Graduate Aptitude Test for Engineering (**GATE-2006**) with **All India Rank 71** (98.4 Percentile)
- **Postdoctoral Research** Fellowship, University of Leuven (KU Leuven), Belgium.
- Qualified National Eligibility Test (**CSIR-JRF**) held in 2005.
- Publications in high impact international journal of repute e.g. *Chem. Soc. Rev.* (IF = 33.38) and *Angew. Chem. Int. Ed.* (IF = 11.26).

Peer Recognition

Area specializations/Research Interest

Organic Synthesis/Green Chemistry

Development of new and environmental friendly methodologies for C-C and C-N bond formation (Direct C-H and C-OH bond activation/functionalization strategies, Ionic liquids, Microwave-assisted organic synthesis, Multi-component reactions (MCRs), Solid phase organic synthesis). Economical synthesis/semi-synthesis of various molecules.

Publications

Research Papers

1. Peshkov, A. A., Peshkov, V. A., Pereshivko, O. P., Van Hecke, K., Kumar, R., & Van der Eycken, E. V. (2015). Heck-Suzuki Tandem Reaction for the Synthesis of 3-Benzazepines. *The Journal of organic chemistry*, 80, 6598-6608. (IF = 4.72)
2. Kumar, R., Ermolat'ev, D. S., & Van der Eycken, E. V. (2013). Synthesis of Differentially Substituted 2-Aminoimidazolidines via a Microwave-Assisted Tandem Staudinger/Aza-Wittig Cyclization. *The Journal of organic chemistry*, 78(11), 5737-5743.. (IF = 4.72)
3. Sharma, U. K., Sood, S., Sharma, N., Rahi, P., Kumar, R., Sinha, A. K., & Gulati, A. (2013). Synthesis and SAR investigation of natural phenylpropene-derived methoxylated cinnamaldehydes and their novel Schiff bases as potent antimicrobial and antioxidant agents. *Medicinal Chemistry Research*, 22(11), 5129-5140. (IF = 1.40)

4. Kumar, R., Shard, A., Bharti, R., Thopate, Y., & Sinha, A. K. (2012). Palladium-Catalyzed Dehydrative Heck Olefination of Secondary Aryl Alcohols in Ionic Liquids: Towards a Waste-Free Strategy for Tandem Synthesis of Stilbenoids. *Angewandte Chemie International Edition*, 51(11), 2636-2639. **(IF = 11.26)**
5. Sharma, U. K., Sharma, N., Salwan, R., Kumar, R., Kasana, R. C., & Sinha, A. K. (2012). Efficient synthesis of hydroxystyrenes via biocatalytic decarboxylation/deacetylation of substituted cinnamic acids by newly isolated *Pantoea agglomerans* strains. *Journal of the Science of Food and Agriculture*, 92(3), 610-617. **(IF = 1.71)**
6. Kumar, R., Sharma, P., Shard, A., Tewary, D. K., Nadda, G., & Sinha, A. K. (2012). Chalcones as promising pesticidal agents against diamondback moth (*Plutella xylostella*): microwave-assisted synthesis and structure–activity relationship. *Medicinal Chemistry Research*, 21(6), 922-931. **(IF = 1.40)**
7. Kumar, R., Sharma, N., Sharma, N., Sharma, A., & Sinha, A. K. (2011). Metal-free activation of H₂O₂ by synergic effect of ionic liquid and microwave: chemoselective oxidation of benzylic alcohols to carbonyls and unexpected formation of anthraquinone in aqueous condition. *Molecular diversity*, 15(3), 687-695. **(IF = 1.90)**
8. Sharma, N., Sharma, U. K., Kumar, R., Katoch, N., Kumar, R., & Sinha, A. K. (2011). First Bovine Serum Albumin-Promoted Synthesis of Enones, Cinnamic Acids and Coumarins in Ionic Liquid: An Insight into the Role of Protein Impurities in Porcine Pancreas Lipase for Olefinic Bond Formation. *Advanced Synthesis & Catalysis*, 353(6), 871-878. **(IF = 5.66)**
9. Sharma, A., Sharma, N., Shard, A., Kumar, R., Mohanakrishnan, D., Sinha, A. K., & Sahal, D. (2011). Tandem allylic oxidation–condensation/esterification catalyzed by silica gel: an expeditious approach towards antimalarial diaryldienones and enones from natural methoxylated phenylpropenes. *Organic & Biomolecular Chemistry*, 9(14), 5211-5219. **(IF = 3.56)**
10. Pd-catalyzed orthogonal Knoevenagel/Perkin condensation-decarboxylation-Heck/Suzuki sequences: Tandem transformations of benzaldehydes into hydroxy functionalized antidiabetic stilbene-cinnamoyl hybrids and unsymmetrical distyrylbenzenes. **(IF = 5.73)**
11. Kumar, R., Mohanakrishnan, D., Sharma, A., Kaushik, N. K., Kalia, K., Sinha, A. K., & Sahal, D. (2010). Reinvestigation of structure–activity relationship of methoxylated chalcones as antimalarials: Synthesis and evaluation of 2, 4, 5-trimethoxy substituted patterns as lead candidates derived from abundantly available natural β -asarone. *European journal of medicinal chemistry*, 45(11), 5292-5301. **(IF = 3.45)**
12. Sharma, A., Sharma, N., Kumar, R., Shard, A., & Sinha, A. K. (2010). Direct olefination of benzaldehydes into hydroxy functionalized oligo (p-phenylenevinylene)s via Pd-catalyzed heterodominant Knoevenagel-decarboxylation-Heck sequence and its application for fluoride sensing π -conjugated units. *Chemical Communications*, 46(19), 3283-3285. **(IF = 6.83)**
13. Sharma, N., Sharma, A., Kumar, R., Shard, A., & Sinha, A. K. (2010). One-Pot Two-Step Oxidative Cleavage of 1, 2-Arylalkenes to Aryl Ketones Instead of Arylaldehydes in an Aqueous Medium: A Complementary Approach to Ozonolysis. *European Journal of Organic Chemistry*, 2010(31), 6025-6032. **(IF = 3.07)**
14. Bhardwaj, A., Kumar Tewary, D., Kumar, R., Kumar, V., Kumar Sinha, A., & Shanker, A. (2010). Larvicidal and structure–activity studies of natural phenylpropanoids and their semisynthetic derivatives against the tobacco armyworm *Spodoptera litura* (Fab.)(Lepidoptera: Noctuidae). *Chemistry &*

biodiversity, 7(1), 168-177. (IF = 1.52)

15. Sharma, A., Sharma, N., Kumar, R., Sharma, U. K., & Sinha, A. K. (2009). Water promoted cascade rearrangement approach towards α -aryl aldehydes from arylalkenes using N-halosuccinimides: An avenue for asymmetric oxidation using phase transfer cinchona organocatalysis. *Chemical Communications*, 5299-301. (IF = 6.83)
16. Sharma, U. K., Sharma, N., Kumar, R., Kumar, R., & Sinha, A. K. (2009). Biocatalytic Promiscuity of Lipase in Chemoselective Oxidation of Aryl Alcohols/Acetates: A Unique Synergism of CAL-B and [hmim] Br for the Metal-Free H₂O₂ Activation. *Organic letters*, 11(21), 4846-4848. (IF = 6.36)
17. Sinha, A. K., Sharma, N., Sharda, A., Sharma, A., Kumar, R., & Sharma, U. K. (2009). Green methodologies in synthesis and natural product chemistry of phenolic compounds. *Indian journal of chemistry. Section B, Organic including medicinal*, 48(12), 1771. (IF = 0.39)
18. Sharma, A., Kumar, R., Sharma, N., Kumar, V., & Sinha, A. K. (2008). Unique Versatility of Ionic Liquids as Clean Decarboxylation Catalyst Cum Solvent: A Metal-and Quinoline-Free Paradigm towards Synthesis of Indoles, Styrenes, Stilbenes and Arene Derivatives under Microwave Irradiation in Aqueous Conditions. *Advanced Synthesis & Catalysis*, 350(18), 2910-2920. (IF = 5.66)
19. Kumar, R., Sharma, A., Sharma, N., Kumar, V., & Sinha, A. K. (2008). Neutral Ionic Liquid [hmim] Br as a Green Reagent and Solvent for the Mild and Efficient Dehydration of Benzyl Alcohols into (E)-Arylalkenes Under Microwave Irradiation. *European Journal of Organic Chemistry*, 2008(33), 5577-5582. (IF = 3.07)
20. Sinha, A. K., Kumar, V., Sharma, A., Sharma, A., & Kumar, R. (2007). An unusual, mild and convenient one-pot two-step access to (E)-stilbenes from hydroxy-substituted benzaldehydes and phenylacetic acids under microwave activation: a new facet of the classical Perkin reaction. *Tetrahedron*, 63(45), 11070-11077. (IF= 2.64)

Patents:

1. Sinha, A. K. Kumar, R. Sharma, A. & Sharma N. One pot multicomponent synthesis of some novel hydroxy stilbene derivatives with alpha, beta-carbonyl conjugation under microwave irradiation. **US 20120165567 A1.**
2. Sinha, A. K. Sharma, A. Kumar, R. & Sharma N. Microwave induced single step green synthesis of some novel 2-aryl aldehydes and their analogues. **US 20120041234 A1.**

Book Chapters

Review Articles

1. Kumar, R., & Van der Eycken, E. V. (2013). Recent approaches for C–C bond formation via direct dehydrative coupling strategies. *Chemical Society Reviews*, 42(3), 1121-1146. (IF = 33.38)

Popular Articles

Monographs

Technical Reports

Workshop/Conferences

Organised

Attended

1. **R. Kumar**, D. Ermolat'ev, E. Van der Eycken, "Microwave-assisted intramolecular Staudinger/aza-Wittig reaction: A new approach to 2-aminoimidazolidines" **16th Sigma Aldrich Organic Synthesis Meeting**, 2012, Spa, Belgium. (*Poster presentation*).
2. **R. Kumar**, D. Ermolat'ev, E. Van der Eycken, "A novel approach to cyclic guanidines (2-aminoimidazolidines)", **13th Belgian Organic Synthesis Symposium (BOSS-XIII)** held on 15-20th July, 2012 at Katholieke universiteit, Leuven, Belgium. (*Member of the organising team and poster presentation*).
3. **R. Kumar**, N. Sharma, A. Sharma, A. K. Sinha. "Green synthesis of bioactive compounds using ionic liquids and microwave", **National Seminar on Chemistry Biology Interface: Recent trends** held on November 21-26, 2010, Ranikhet, Almora, India. (*Oral presentation*).
4. **R. Kumar**, A. Sharma, N. Sharma, V. Kumar, A. K. Sinha. "A green microwave induced decarboxylation of indole and nitro aryl substituted carboxylic acid", **12th International ISCBC conference on the Interface of Chemistry and Biology** (Feb. 22-24, 2008) at Birla Institute of Technology and Science (BITS), Pilani, India. (*Poster presentation*).
5. **2nd National Symposium on Analytical Sciences (NSAS)** on "Analytical innovations for Process and Technology Development" (Nov. 23-25, 2008) at Institute of Himalayan Bioresource Technology (IHBT), Palampur, India (*Member of the organising team*)
6. **3rd International Conference on "Council of Surface Science and Catalysis"** (Dec. 8-9, 2003) at Department of Pure and Applied Chemistry, M.D.S. University, Ajmer, India

Poster presentation (as a group member):

7. U. K. Sharma, N. Sharma, **R. Kumar**, R. Kumar, R. C. Kasana, A. K. Sinha. poster entitled "Greener approaches towards synthesis of bioactive phenolics: use of biocatalysts and ionic liquids", **8th Green chemistry conference** held on 9-11th September, 2009 held at Universidad de Zaragoza, Spain.
8. A. Sharma, N. Sharma, **R. Kumar**, A. K. Sinha. poster entitled "Water promoted metal-free, single step synthesis of α -aryl aldehydes from arylalkenes using *N*-halosuccinimides under microwave irradiation", **10th Tetrahedron Symposium** held on June 23-26, 2009, Paris, France.
9. A. Sharma, **R. Kumar**, N. Sharma, A. K. Sinha. poster entitled "Ionic liquids as a new class of clean decarboxylation agents for aromatic acids under microwave in aqueous conditions", **13th ISCBC**

International conference on the Interplay of Chemical and Biological Sciences held on Feb 26th-March 1st, 2009, at University of Delhi, New Delhi, India.

10. A. Sharma, R. Kumar, N. Sharma, V. Kumar, A. K. Sinha. Presented poster entitled “DDQ catalyzed stereoselective synthesis of (*E*)- α,β unsaturated aromatic carbonyl compounds”, **12th International ISCBC conference on the Interface of Chemistry and Biology** (Feb. 22-24, 2008) at Birla Institute of Technology and Science (BITS), Pilani, India.

Research Grants

Rs. 22 Lakhs, by Department of Science and Technology (**DST**), Govt. Of India, under **Fast Track Scheme** for Young Scientists.

Other Achievements

Collaboration