

Dr. AKSHAY KUMAR

Present Address:

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Academic Profile:

Ph. D. **2008-2013** (Guru Nanak Dev University, Amritsar)
Thesis entitled: *Development of Primary Amine-Based Organocatalysts for Asymmetric Carbon-Carbon Bond Formation*
Supervisor: **Dr. Swapandeep Singh Chimni** (*Professor*)

	Board/University	Year	%age	Division
M. Sc. Chemistry	Guru Nanak Dev University, Amritsar	2005-07	67.49	1 st
B.Sc. (Non-Med.)	HPU Shimla	2002-04	76.47	1 st

✚ Qualified **NET (JRF-CSIR)** in 2007

✚ Qualified **GATE** in 2007

Research Interests:

❖ Asymmetric Catalysis, Organocatalysis, Green Chemistry.

Teaching/Research Experience:

- ✓ March 2023-Till date: **Assistant Professor at CU Jammu**
- ✓ August 2014-March 2023: **Assistant Professor at DAVU Jalandhar**
- ✓ January 2014- May 2014: **Assistant Professor at GGSWU Fatehgarh Sahib.**
- ✓ April 2013 – January 2014: **Research Associate**
- ✓ March 2010 – March 2013: **Senior Research Fellow**
- ✓ February 2008 - February 2010: **Junior Research Fellow**
- ✓ July 2007 - January 2008: **Trainee Research Associate** at Ind. Swift (*Pharmaceutical Company*), R & D Centre, Mohali, Punjab, India.

Academic Awards/Fellowship/Achievements:

- ✓ **Best Poster Award** in INDO-US Workshop on Green Chemistry for Environments & sustainable Development held on 11th – 13th March, 2012, at Dehradun.
- ✓ Awarded a Research Fellowship from CSIR as **Research Associate** (RA) for pursuing research in synthetic organic chemistry (April 2013 – Current).
- ✓ Awarded a Research Fellowship from CSIR as **Senior Research Fellow** (SRF) for doing research toward an advance degree (Ph.D.) (March 2010 –March 2013).
- ✓ Awarded a Research Fellowship from CSIR as **Junior Research Fellow** (JRF) for doing research toward an advance degree (Ph.D.) (February 2008- February 2010).
- ✓ **Qualified Joint CSIR-UGC Test** for Junior Research Fellowship and Eligibility of Lectureship (NET) in June 2007.
- ✓ **Qualified Gate Test** in February 2007.

Research Activities (Conferences and Symposia):

- ✓ **Poster Presentation** on “Development of Primary Amine-Based Organocatalysts for Asymmetric Carbon-Carbon Bond Formation” **A. Kumar** and S. S. Chimni, at ICCOS conference at Moscow, Russia, 15th – 20th September, 2012.
- ✓ **Poster presentation (Best Poster Award)** on “Development of an Eco-friendly Protocol to Procure Chiral 3-Alkyl-3-hydroxy-2-oxindoles: A Potential Bioactive Molecule” **A. Kumar** and S. S. Chimni, at INDO-US Workshop on Green Chemistry for Environments & sustainable Development 11th – 13th March, 2012, at Dehradun.
- ✓ **Poster presentation** on “Organocatalyzed Enantioselective Aldol Reaction of Cyclohexanone and Isatin: Synthesis of 3-Cycloalkanone-3-Hydroxy-2-Oxindoles” **A. Kumar** and S. S. Chimni, at National Symposium on Chemistry in 21st Century at Guru Nanak Dev University, Amritsar, December 23-24, 2011,
- ✓ **Poster presentation** on “Asymmetric *syn*-Selective Direct Cross-Aldol Reaction Catalyzed by Diamine Organocatalysts Derived from Natural Amino Acid” **A. Kumar** and S. S. Chimni, at 6th Junior National Organic Symposium Trust Conference (J-NOST) School of Chemistry, University of hyderabaad, India, January 28 -31, 2011.

Research Publications

Sr. No.	Title of the Paper	Author(s)	Name of the Journal	Volume	Year	Pages
1	Recent development in asymmetric organocatalytic domino reactions involving 1,6-addition as a key step	Y. Hussain, Tamanna M. Sharma, A. Kumar, and P. Chauhan	Org. Chem. Front.	9	2022	572-592
2	Free Amine, Hydroxyl and Sulfhydryl Directed C-H Functionalization and Annulation: Application to Heterocycle Synthesis	S. Kumar, A. Kumar, D. Sharma, P.Das	Chemical Record	-	2022	e202100171

Curriculum Vitae

3	Experimental and DFT Studies of Organocatalytic Microwave-Assisted Reaction of Isatin Derivatives with Dinitrotoluenes	J. Kaur, N. Islam, A. Kumar, S.S. Chimni	Asian Journal of Organic Chemistry	6	2017	575-582
4.	Organocatalytic enantioselective synthesis of C3 functionalized indole derivatives	J. Kaur, N. Islam, A. Kumar, V.K. Bhardwaj, S.S. Chimni	Tetrahedron	72	2016	8042-8049
5.	Organocatalytic enantioselective synthesis of N-alkyl/aryl-3-alkyl-pyrrolidine-2,5-dione in brine	S. Mahajan, P. Chauhan, A. Kumar, S.S. Chimni	Tetrahedron Asymmetry	27	2016	1145-1152
6.	Catalyst-Free Synthesis of 3-Aryl-3-hydroxy-2-oxindole Derivatives by Using Water as the Solvent: Experimental and DFT Studies	N. Kumar, J. Kaur, A. Kumar, N. Islam, S. S. Chimni	Asian Journal of Organic Chemistry	5	2016	1334-1344
7.	Stereoselective synthesis of 3-amino-2-oxindoles from isatin imines: new scaffolds for bioactivity evaluation	J. Kaur, S. S. Chimni, S. Mahajan, A. Kumar	RSC Advances	5	2015	52481-52496
8.	Maleimide as an efficient nucleophilic partner in the aza-Morita-Baylis-Hillman reaction: Synthesis of chiral 3-substituted-3-aminooxindoles	A. Kumar, V. Sharma, J. Kaur, N. Kumar, S. S. Chimni	Organic and Biomolecular Chemistry	13	2015	5629-5635
9.	Synthesis and stereochemistry-activity relationship of chiral thiourea derivatives as potential anticancer agents	V. Kumar, A. Kumar, V. V. Sureshbabu, S. S. Chimni	Anti-Cancer Agents in Medicinal Chemistry	14	2014	910 - 920
10.	Organocatalytic asymmetric Friedel-crafts reaction of sesamol with isatins: Access to biologically relevant 3-aryl-3-hydroxy-2-oxindoles	A. Kumar, J. Kaur, P. Chauhan, S. S. Chimni	Chemistry - An Asian Journal	9	2014	1305-1310
11.	Organocatalytic enantioselective aza-Henry reaction of ketimines derived from isatins: Access to optically active 3-amino-2-oxindoles	A. Kumar, J. Kaur, S. S. Chimni, A. K. Jassal	RSC Advances	4	2014	24816-24819
12.	Cinchonidine thiourea catalyzed asymmetric addition of phenols to oxindole derivatives	J. Kaur, A. Kumar, S. S. Chimni	RSC Advances	4	2014	62367-62374
13.	Organocatalytic asymmetric Friedel-Crafts reaction of 1-naphthols with isatins: An enantioselective synthesis of 3-aryl-3-hydroxy-2-oxindoles	J. Kaur, A. Kumar, S. S. Chimni	Tetrahedron Letters	55	2014	2138-2141
14.	Primary-tertiary diamine-catalyzed Michael addition of ketones to isatylidenemalononitrile derivatives	A. Kumar, S. S. Chimni	Beilstein J. Org. Chem.	10	2014	929-935
15.	Cinchona-derived thiourea catalyzed hydrophosphonylation of ketimines: enantioselective synthesis of α -amino phosphonates	A. Kumar, V. Sharma, J. Kaur, N. Kumar, S. S. Chimni	Tetrahedron	70	2014	7044-7049
16.	Organocatalyzed direct asymmetric aldol reaction of isatins in water: Low catalyst loading in command	A. Kumar, S. S. Chimni	Tetrahedron	69	2013	5197-5204
17.	Organocatalytic asymmetric direct aldol	A. Kumar, S. S. Chimni	European Journal	2013	2013	4780-4786

	reaction of pyruvic aldehyde dimethyl acetal with isatin derivatives		of Organic Chemistry			
18.	Catalytic asymmetric synthesis of 3-hydroxyoxindole: A potentially bioactive molecule	A. Kumar, S.S. Chimni	RSC Advances	2	2012	9748-9762
19.	Asymmetric syn-selective direct aldol reaction of protected hydroxyacetone catalyzed by primary amino acid derived bifunctional organocatalyst in the presence of water	Akshay Kumar, Sarbjit Singh, Vikas Kumar, Swapandeeep Singh Chimni	Organic and Biomolecular Chemistry	9	2011	2731-2742
20.	The pH of the reaction controls the stereoselectivity of organocatalyzed direct aldol reactions in water	S. S. Chimni, S. Singh, A. Kumar	Tetrahedron Asymmetry	20	2009	1722-1724

Sponsored Research Projects

Sr. No.	Sponsoring Agency	Title of the Project	Period	Amount (Rs)	Principal Investigator / Co-Investigator, If any
1.	DST-SERB	Development of Organocatalyzed Vinylogous Reactions of Isatin Derivatives for Synthesis of Highly Functionalized 3,3'-disubstituted-2-Oxindoles: A Potential Bioactive Molecule.	3 Years	18,20,800/-	Akshay Kumar (PI)

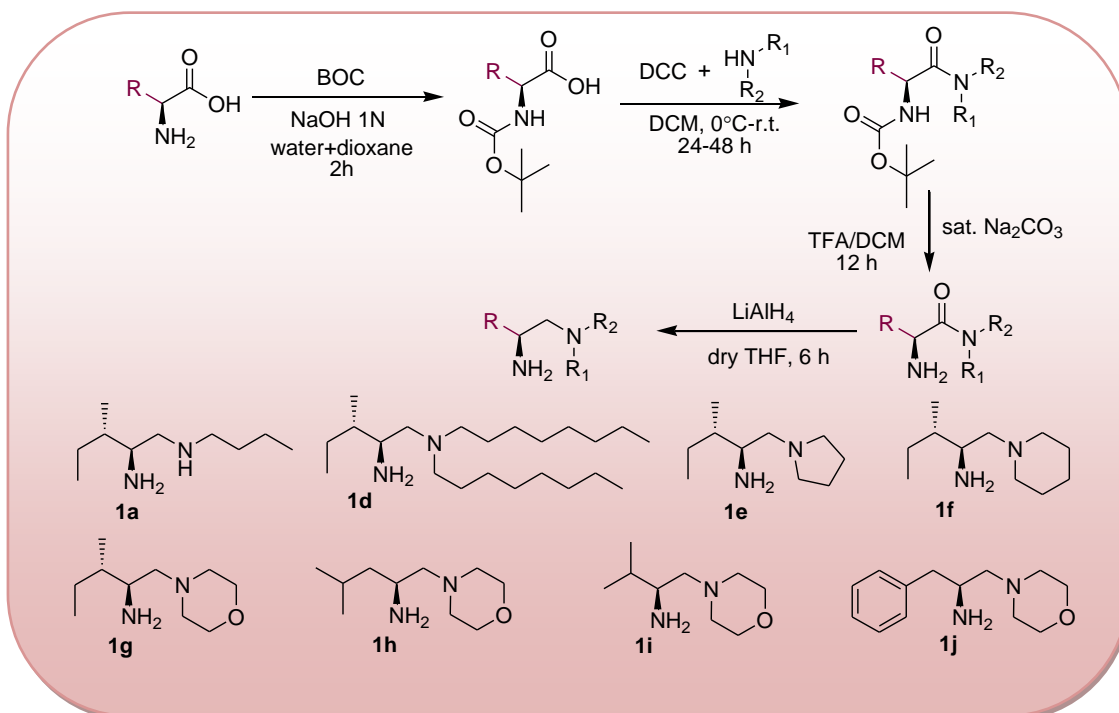
A Brief Summary of Ph.D. Research Work:

During my PhD course, I worked in the field of *Asymmetric Organocatalysis* where I explored different types of *Primary Amine-based Organocatalysts* for asymmetric organic transformations. All catalysts were synthesized from variety of natural acyclic amino acids and *Cinchona* alkaloids.

I have synthesized a series of primary-tertiary diamine organocatalysts derived from natural acyclic amino acids. The catalytic potential of these catalysts were explored for aldol and Michael reactions under aqueous and non-aqueous conditions. The direct aldol reaction of protected hydroxyacetone and dihydroxyacetone with aldehydes was efficiently catalyzed by diamine **1** in the presence of water. The catalyst **1** was also successfully catalyzed the direct aldol reaction of acetone/cyclohexanone with isatins using water as a solvent. Michael addition of ketones to isatylidinemalononitriles was catalyzed by diamine **1** in combination with D-CSA in dichloroethane provided 3,3'-disubstituted 2-oxindoles in highly

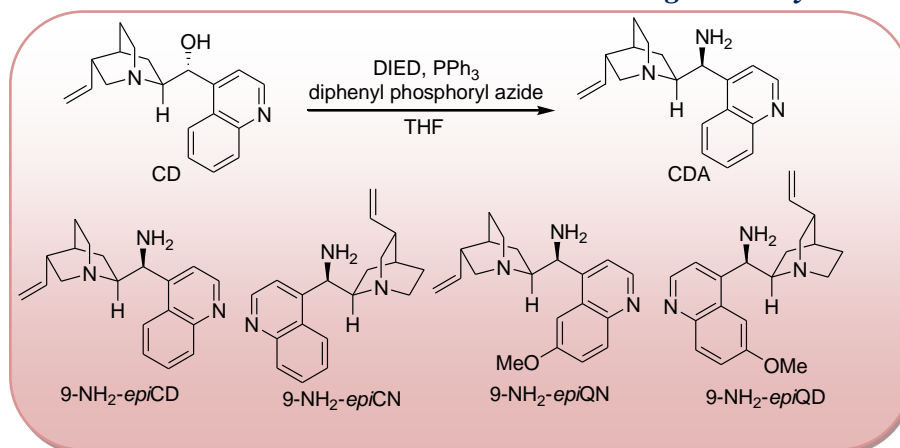
enantioselective manner. The 3,3'-disubstituted 2-oxindole could be transformed into spirooxindoles by reduction with NaBH_4 .

✚ Natural Acyclic Amino Acids Derived Diamine Organocatalysts



The catalytic potential of *Cinchona* alkaloids-primary amines were explored for pyruvate-type aldol reaction. The *Cinchona*-amine **2** efficiently catalyzes the direct aldol reaction of pyruvic aldehyde dimethyl acetal with isatins providing 3-substituted 3-hydroxy-2-oxindoles in high enantioselectivity (88-97%). Both enantiomeric 3-substituted 3-hydroxy-2-oxindoles were obtained using *pseudo*-enantiomeric organocatalysts in highly enantioselective manner.

✚ Cinchona Alkaloids Derived Cinchona-Amine Organocatalysts



✓ Application of Organocatalysts for Direct Asymmetric Aldol and Michael Reactions

