Anirban Das

Objective: A position in research/analysis in the field of chemical sciences with emphasis on renewable energy/ catalysis/ nanotechnology.

Education

MS (Inorganic Chemistry) 2007, University of Toledo, USA.
PhD (Inorganic Chemistry) 2012, University of Idaho, USA.

Work Experience

2012-2014 Post Doc, Northwestern University, USA.
2014-2015 Post Doc, University of California, USA.
2015-2017 Post Doc, Wayne State University, USA.
2017- Pool Scientist, Indian Institute of Technology, Delhi, India.

Highlights:

- Highly proficient in **Catalysis, Nanotechnology and Organometallics**.
- Experienced in **homogeneous and heterogeneous catalysis** including reactions involving **biomass conversion and gas phase reactions**. Worked homogeneous and heterogeneous catalysts, including complex **metal oxides** (Ruddlesden-Popper oxides), **noble metals (Au)** nano structures and small molecule/ **organometallic complexes**.
- In-depth knowledge in chemical kinetics and reaction mechanism through **NMR** spectroscopy including 2D, heteronuclear, solid state, VT and in-situ techniques as well as through **GC/MS** (for gas phase reactions in flow reactors)**, LC/MS and HPLC**.
- Experienced in synthesis & characterization of nanomaterials & organometallic complexes.
- Proficient in **Schlenk** techniques, **Raman**, **IR, TEM, SEM**, small molecule and powder **XRD, electrochemical studies** using rotating-ring disk electrode, analysis of surface characterization data obtained from **XPS** and **LEIS** studies.
- Experienced in computer programming including **simulation and modeling of kinetics**, device interfacing using high level languages e.g. C, C++/VC++, Visual Basic and curve fitting softwares e.g. IGOR.
- Experience in use of **Ionic Liquids** and **Supercritical CO_2** as reaction media.
- **Reviewer** for scientific papers including **ACS Nano** and proposals from **European Union**.

Previous Job Experience:

1) **Post-Doctoral Fellow (Oct 2015- March 2017) Department of Chemical Engineering and Material Sciences, Wayne State University, Detroit Michigan, USA.** Work Description: Thermal and electro-catalysis with emphasis on oxygen surface exchange and oxygen reduction reactions using complex layered first series Ruddlesden-Popper Oxides.
2) **Post-Doctoral Fellow (Aug 2014- Oct 2015) University of California, Riverside, USA.** Advisor: **Prof Francisco Zaera.** Work Description: Synthesis and testing of supported bifunctional catalysts for tandem reactions.

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3) **Post-Doctoral Fellow (July 2012-Aug 2014), Northwestern University**, **Chicago**, **USA**. Institute for Atom Efficient Chemical Transformations (an EFRC under DOE), Center for Catalysis and Surface Science, **Advisor: Prof. Eric Weitz.** Work Description: Mechanistic investigations of catalytic biomass utilization reactions via kinetics studies using homogeneous catalysts.

Education:

Ph.D Inorganic Chemistry, University of Idaho (Advisor: Dr. C. M. Wai) USA July 2012
Dissertation Topic: "Manipulation of Optical Properties of Lead Sulfide Quantum dots and their attachment to Carbon Nanotubes" ISBN: 9781267664341

MS Inorganic Chemistry, University of Toledo, Ohio, USA (Advisor: Dr. M. Mason) 2007
Thesis Topic "Di(3-methylindolyl)methane Complexes of Aluminum and Gallium Alkyls" ISBN 0549348212, 9780549348214.

BSc. Chemistry (Hons), Hansraj College, University of Delhi, India.

"A" Level 2002 (Equivalent to Post Graduate diploma in Computer Applications) DOEACC (Ministry of Communication & Information Tech., Govt. of India, New Delhi)

High School: Delhi Public School R K Puram, New Delhi.

Past Research Experience:

Wayne State University:

- Synthesis, characterization and evaluation of surface oxygen exchange properties of Co, Cu and Fe doped $La_2NiO_{4+\delta}$.
- Synthesis and characterization of catalysts, with preferentially terminated planes for maximum surface oxygen exchange activity.
- Set up system to perform line real time MS analysis of effluents of a flow reactor in which oxygen exchange reaction was being performed with isotopically labelled oxygen.

Northwestern University:

- Carried out detailed mechanistic investigation of the acid-catalyzed dehydration of fructose leading to production of 5-hydroxymethyl furfural (HMF) and further rehydration of HMF to formic and levulinic acids. HMF can be readily converted into other useful molecules, such as dimethylfuran, furan dicarboxylic acid, gamma-valerolactone, and levulinic acid. These, in turn, can be converted to liquid transportation fuels and chemical feedstocks.
- Primary technique used was NMR including multidimensional, heteronuclear (^{17}O), in-situ Variable Temperature and solid state NMR techniques**.** Project involved characterization of intermediates, experimental monitoring the chemical kinetics as well as simulation and modeling to obtain mechanistic information.
- Synthesis and characterization (solid state NMR, UV-Vis, IR, LC-MS and UV-Raman) of polymeric materials from biomass sources, specifically humins produced as a side product of biomass conversion processes.

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Ph.D research

- Quantum confined PbS Quantum Dots (QD) absorbing in the NIR region are potentially important candidates for QD and QD sensitized solar cells (QDSC & QDSSC), in telecommunication applications and biological sensors.
- Synthesis of PbS QD of sizes 2-5 nm, their attachment to single and multiwalled carbon nanotubes and energy transfer phenomenon in the composites was investigated for potential energy harvesting and sensor applications.

MS Research

- Synthesized complexes of Al and Ga alkyls with N donor Diindolylmethane ligands and characterized them by NMR and single crystal X-Ray diffraction studies. The complexes would be subjected to alkyl abstraction to generate a highly Lewis acidic site for possible binding and activation of bases like CO for development of new synthetic routes. Primary techniques used was NMR including COSY, HETCOR, HMBC and HSQC. I also carried out simulation of complex distereotopic proton signals in MNOVA to aid assignment of experimental data.

Other Relevant Projects

- *"Microcontroller Based Instruments in Chemistry Laboratories"*. Fabricated Microcontroller 8051 based potentiometer, pH meter and colorimeter. Developed software for PC interface of above in Visual Basic at Ministry of Communication & Information Tech., Govt. of India, New Delhi, India.

Relevant Work Experience

- 2007-2012: Research Assistant and Teaching Assistant at Univ. of Idaho, and Univ. of Toledo, Ohio. (TA for General, Organic, Inorganic, & Instrumental laboratories.
- 2001-2004 Faculty: Indira Gandhi National Open University, New Delhi India.
  Teaching computer programming and data structures through C/C++ to BS & MS students.

Publications

1) **Das, A.**; Ganguli, A. K. "Design of diverse nanostructures by hydrothermal and microemulsion routes for electrochemical water splitting" *RSC Adv.*, **2018**, 8, 25065-25078.

2) Gu, X.; Carnerio, J.; Samira, S.; **Das, A.**; Ayasinghr, N.; Nikolla, E. "Efficient Oxygen Electrocatalysis by Nanostructured Mixed-Metal Oxides" *J. Am. Chem. Soc.,* **2018***, 140,* 8128-8137.

3) Fneich, B. N.; **Das, A.**; Kirschbaum, K.; Mason, M. R. "Bidentate and Tridentate Coordination Modes of Di(3-methylindolyl)-2-pyridylmethane in Complexes of Aluminum and Gallium: Structural Characterization of Bridging N-Indolide in a Dialuminum Complex," *J. Organomet. Chem.* **2018**, 872, 12-23.

4) **Das, A.** Xhafa, E. Nikolla, E. "Electro and thermal Catalysis by layered first series Ruddlesden-Popper Oxides," *Catalysis Today*, **2016**, *277*, 214.

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5) Wang, J. S.; Ullrich, B.; **Das, A.**; Wai, C. M.; Brown, G. J.; Dass, C. K.; Hendrickson, J. R. "Luminescence Studies for Energy Transfer of Lead Sulfide QD Films" *RSC Advances* **2016,** *6*, 48651.

6) Wang, J. S.; Ullrich, B.; Dass, C. K.; **Das, A**.; Wai, C. M.; Brown, G. J.; Hendrickson, J. R. ; "Luminescence and transient lifetime studies for energy transfer of PbS QD films"; *Proceedings of SPIE*, **2017**, *10344*, 103440R- 1.

7) Zhang, J.; **Das, A.**; Assary, R.; Curtis, L.; Weitz, E. "A combined experimental and computational study of the mechanism of fructose dehydration to 5-hydroxymethylfurfural using Amberlyst 70, PO43-/niobic acid or Sulfuric Acid as catalysts in dimethyl sulfoxide" *Applied Catalysis B: Environmental,* **2016**, *81*, 874-887.

8) **Das, A.**; Wai, C.M "Ultrasound-Assisted Synthesis of PbS Quantum Dots Stabilized by 1,2-Benzenedimethanethiol and Attachment to Single-Walled Carbon Nanotubes" *Ultrasonics Sonochemistry* **2014,** *21*, 892-900.

9) **Das, A.**; Wai, C.M: Non-Covalent Attachment of PbS Quantum Dots to Single- and Multi-Walled Carbon Nanotubes. *J. Nanotechnology* , **2014**, DOI: 10.1155/2014/285857.

10) **Das, A.**; Wai, C.M "Energy Transfer Between PbS Quantum Dots in the Liquid Phase". *Materials Chemistry and Physics,* **2014**, *147*, 514-520.

11) Patankar, S. N.; **Das, A**.; Kranov, Y. A.: "Interface engineering via compatibilization in HDPE composite reinforced with sodium borosilicate hollow glass microspheres" *Composites, Part A: Applied Science and Manufacturing* **2009**, 40A(6-7), 897-903.

12) Manolata Devi, M.; Sunaina; Singh, H.; Kaur, K.; Gupta, A.; **Das, A.**; Nishanthi, S. T.; Bera, C.; Ganguli, A. K.; Menaka. "New approach for the transformation of metallic waste into nanostructured Fe3O4 and SnO2-Fe3O4 heterostructure and their application in treatment of organic pollutant" *Waste Management* **2019,** *87*, 719-730.

13) Ganguli, A. K.; **Das, A.**; Kalithasan, N. "Core-shell type semiconducting heterostructures for visible light photocatalysis" *The Chemical Record*, Submitted.

14) Rashid, N.; Bhat, M. A.; **Das, A**.; Ingole, P. "Unprecedented lower over-potential for CO2 electro-reduction on copper oxide anchored to reduced graphene oxide microstructures" *Electrochimica Acta*, Submitted.

15) **Das, A.**; Weitz, E. "Investigation into the Kinetics of Acid Catalyzed Dehydration of Fructose to 5-hydroxymethylfurfural: Effect of Acidity and Temperature" Manuscript in preparation.

16) **Das, A.**; Kingsley, N. B.; Kirschbaum, K.; Sieg, L. A.; Mason, M. R. "Bidentate and Tridentate Coordination Modes of Di(3-methylindolyl)-2-imidazolylmethane in Complexes of Aluminum and Gallium," *J. Organomet. Chem.,* Manuscript in preparation.

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17) **Das, A.**; Dagar, P.; Ganguli, A. K. "Effect of Au nanoparticle loading on the photo-electrochemical response of Au-P25-TiO2 catalysts" Manuscript in preparation.

Oral presentations

1) Kinetics of Reaction of Fructose to form 5-(hydroxymethyl) furfural **Das, A.**; Zhang, J.; Weitz, E. 5th Annual Midwest Regional Conference, American Institute of Chemical Engineers (AIChE), Illinois Institute of Technology, Chicago, IL, USA Jan. 30. 2013.
2) Kinetics of Reaction of Fructose to form 5-(hydroxymethyl) furfural **Das, A.**; Zhang, J.; Weitz, E. North American Catalysis Society 23rd Annual Meeting (NAM), Lousiville, KY, USA, June 2013.
3) Energy Transfer Between PbS Quantum Dots in the Liquid Phase **Das, A.**; Wai, C.M . 246th American Chemical Society (ACS) National Meeting, Indianapolis, IN, USA, Sept. 2013.
4) Kinetics of Reaction of Fructose to form 5-(hydroxymethyl) furfural Das, A.; Zhang, J.; Weitz, E. 246th ACS National Meeting, Indianapolis, IN, USA, Sept. 2013).
5) Simple sonochemical synthesis of lead sulfide Quantum Dots stabilized by aryldithiols **Das, A**.; Wai, C. M. Regional Meeting of the American Chemical Society, Pullman, WA, USA. June 2010.
6) Study of the mechanism for the formation of formic and levulinic acids from HMF Weitz, E.; **Das, A.**; Drake, T.; Stair, P. C. 250th ACS National Meeting & Exposition, Boston, MA, USA, August 16-20, 2015, ENVR-138.
7) Effect of Doping on the Activity of Nickelate Oxides Toward surface Oxygen Exchange and Oxygen Reduction; Gu, X. K.; **Das, A.**; Carnerio, J. A. S.; Nikolla, E. Annual AIChE meeting, 2016, San Francisco California, USA. November-15-2016.
8) Tuning the Electrochemical Activity of Layered Nickleate Oxides for Surface Oxygen Exchange: Effect of Surface Termination and Composition **Das, A.**; Gu, X.; Carneiro, J.; Nikolla, E. North American Catalysis Society 25th Annual Meeting (NAM), Denver, CO, USA, June 4-9, 2017. Abstract #16456.
9) Unusual Multiferroic Property in HoCr0.5Mn0.5O3 Sarkar, A.; **Das. A**.; Ganguli, A. K. 10th International Conference on Materials and Advanced Technologies, ICMAT 2019, Singapore, June 23-28, 2019.

Poster Presentations

10) Mechanistic Studies of Conversion of Fructose into Formic and Levulinic Acids **Das, A.**; Weitz, E. 6th Annual Midwest Regional Conference, American Institute of Chemical Engineers (AIChE), Univ. Illinois at Chicago. IL, USA, March. 10, 2014.
11) Mechanistic Studies of Conversion of Fructose into Formic and Levulinic Acids **Das, A.**; Weitz, E. Annual Review of the Institute for Atom Efficient Chemical Transformations, Argonne National Laboratories, IL, USA, Feb 20-21, 2014.
12) Investigation into the Kinetics of Acid Catalyzed Dehydration of Fructose to 5-hydroxymethylfurfural: Effect of Acidity and Temperature. **Das, A.**; Zhang, J.; Weitz, E. Catalysis Club of Chicago, British Petroleum Center, Naperville, IL, USA, May 07, 2013.
13) Kinetics of Reaction of Fructose to form 5-(hydroxymethyl) furfural **Das, A.**; Zhang, J.; Weitz, E. Annual Review of the Institute for Atom Efficient Chemical Transformations, Argonne National Laboratories, IL, USA, Jan. 29-30, 2013.

14) Kinetics of Reaction of Fructose to form 5-(hydroxymethyl) furfural **Das, A.**; Zhang, J.; Weitz, E. Center for Catalysis and Surface Science 2012 Annual Scientific Meeting, Northwestern University, Evanston, IL, USA, Oct 22, 2012.
15) A simple sonochemical method for synthesizing alkyldithiol and aryldithiol stabilized metal sulfide nanoparticles **Das, A.**; Wai, C. M. College of Science Research Exposition, University of Idaho, Moscow, ID, USA, 2009.
16) Di(3-methylindolyl)methane complexes of aluminum and gallium **Das, A.**; Fneich, B. N.; Kingsley, N.; Kirschbaum, K.; Mason, M. R. 233rd ACS National Meeting, Chicago, IL, USA, March 25-29, 2007.
17) Di(3-methylindolyl)methane complexes of aluminum and gallium , **Das, A.**; Fneich, B. N.; Kingsley, N.; Kirschbaum, K.; Mason, M. R. Ohio Inorganic Weekend, 2006, Ohio Univ. Athens, OH, USA.
18) A study of humins formed in the conversion of fructose to formic and levulinic acids. **Das, A.**; Weitz, E. Catalysis Club of Chicago, British Petroleum Center, Naperville, IL, USA, May 13, 2014.
19) Studies towards development of more efficient processes for energy harvesting **Das, A**. Industrial Associates Meeting, Dept. of Chemistry, Northwestern University, Evanston, Il, USA, May 01, 2014.
20) Luminescence and transient lifetime studies for energy transfer of PbS QD films Wang, J. S.; Ullrich, B.; Dass, C. K.; **Das, A.**; Wai, C. M.; Brown, G. J.; Hendrickson, J. R. Year **2017**, SPIE conference on Nanophotonic Materials XIV , San Diego, California, USA, 9 - 10 August 2017.
21) Nanostructured, Targeted Layered Metal Oxides as Active and Selective Heterogeneous Electrocatalysts for Oxygen Evolution, Nikolla, E.; **Das, A.**; Gu. X. Department Of Energy Hydrogen and Fuel Cells Program review, Washington DC, USA, June-06-2016.
22) Photoelectrocatalytic studies on Titania supported Au Nanoparticles, **Das, A**.; Kumar, S.; Ganguli, A. ICONSAT-2018, Bengaluru, India, March 20-23, 2018.

Grants

Graduate & Professional Student Association (GPSA) grant to organize **workshop on Raman Spectroscopy by Dr Peter Griffiths** (2009 at University of Idaho). I was co-instructor for the course.

Relevant Awards & Honors

- American Crystallographic Association scholarship to attend one week summer school in Chemical Crystallography, 2016.
- Larry Nash Award : Department of Chemistry, University of Idaho -2010.
- American Chemical Society travel award for National ACS conference in Chicago March 2007
- All India First Position in programming through C++/VC++ in DOEACC exam.
- Junior Science Talent Search Scholarship awarded by the Delhi Government, India.

Leadership Roles

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- University of Idaho GPSA (Graduate and Professional Student Association): Vice President 2009-10, Senate Speaker 2010-12. Chief Justice 2008-09. Representative to Faculty council & Graduate Council 2010-2011.
- Promotion Committee member for Professor post at Dept of Chemistry, Univ Idaho, USA
- House Captain at Delhi Public School, R.K.Puram, New Delhi, India.

Certifications: GLP (Good laboratory Practices)
Affiliations: American Chemical Society, Catalysis Club of Chicago, Michigan Catalysis Society.

References:

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