Curriculum Vitae

Abhijeet Lale

abhijeet.lale@gmail.com | abhijeet.lale@etu.umontpellier.fr | +33 75 25 46 065

Date of birth: 14/03 /1990 (Age: 27 years); Nationality: Indian

Education:

Institut Européen des Membranes, University of Montpellier, Montpellier, France *Oct'14- Oct'17*

Ph.D. in Physical Chemistry and Chemistry of Materials

Doctoral Thesis:

*Synthesis and characterization of **silicon** and **boron** -based **nitride nanocomposites** as **catalytic mesoporous supports** for **energy** applications*

Guide: Dr. Samuel Bernard (Senior Research Scientist, CNRS, Institut Européen des Membranes)

- Synthesis and characterization of multifunctional **Si** and **B** based **carbonitride/nitride nanocomposites** through chemistry of **preceramic polymers**
- Development of above mentioned nanocomposites **3D mesoporous** structures for use as **catalyst supports** in hydrolysis of liquid inorganic **H_2 carriers**, **electrocatalysis** and **removal of dye** via **photocatalysis** and adsorption
- Development of **silicon carbonitrides/MXene nanocomposites** for use as electrodes in **supercapacitors** and **electrocatalysis**

Skills:

Equipment: SEM, TEM, X-ray Photoelectron Spectroscopy, X-Ray Diffractometer (including Rietveld refinement and phase analysis), Infrared spectroscopy, cyclic voltammetry, impedance spectrosocpy, X-ray fluorescence spectroscopy, Raman spectroscopy, UV spectrophotometer, Liquid/Solid-State NMR, Planetary Ball Mill, Thermal cycling unit , schlenk line processing (nanoparticle and inorganic polymer synthesis), hydrolysis bench setup, vacuum furnace.

Programming Languages: C++ Software Packages: MATLAB™, Abaqus™ and LAMMPS

Publications:

- Organosilicon Polymer-Derived Mesoporous 3D Silicon Carbide, CarboNitride and Nitride Structures as Platinum supports for Hydrogen Generation by Hydrolysis of Sodium Borohydride, ***A. Lale**, A. Wasan, R. Kumar, P. Miele, U. B. Demirci, S. Bernard, Inter. J. Hydrogen Energy, **41**, 2016, 15477-15488*.
- A comprehensive study on the influence of the polyorganosilazane chemistry and material shape on the high temperature behavior of titanium nitride/silicon nitride nanocomposites, ***A. Lale**, V. Proust, MC Bechelany, A Viard, S Malo, S Bernard, Journal of European Ceramic Society- http://doi.org/10.1016/j.jeurceramsoc.2017.04.001*
- Micro-/Mesoporous Platinum-SiCN Nano-composite Catalysts (Pt@SiCN): From Design to Catalytic Applications, S.*M. Sachau, M. Zaheer, **A. Lale**, M.P.Friedrich, C.E. Denner, U.B. Demirci, S. Bernard, G. Motz, R. Kempe, Chem. Eur .J. ,2016, **22** ,15508–15512*
- Nanocomposites through Chemistry of Single-Source Precursors: Understanding the Role of Chemistry behind the Design of Monolith-Type Nanostructured Titanium Nitride/Silicon Nitride, *Bechelany MC, Proust V, **Lale A**, Miele P, Malo S, Gervais C, Bernard S, Chem. Eur. J., 2017, **23,** 832-845*
- Molecular Chemistry and Engineering of Boron-Modified polyorganosilazanes as New Processable and Functional SiBCN Precursors, *A. Viard, D. Fonblanc, M. Schmidt, **A. Lale**, C. Salameh, A. Soleilhavoup, M. Wynn, P. Champagne, S. Cerneaux, F. Babonneau, G. Chollon, F. Rossignol, C. Gervais, S. Bernard, Chem. Eur. J., 2017, **23**, 9076-9090*

Indian Institute of Technology (IIT) Madras, Chennai, India *2009 – 2014*

Dual Degree (Bachelors & Masters) **CGPA: 8.38 (on 10 point scale)**

Major: Metallurgical and Materials Engineering Minor: Chemistry

Dual Degree Project for Masters' Thesis: *June'13- May'14*

Development of Phosphate based Thermal Barrier Composite Coatings for turbine engines and turbochargers

Guide: Dr. Ashutosh S. Gandhi (Department of Metallurgical and Materials Engineering, IIT Madras)

- Evaluation of solution precursor plasma sprayed **$M_2Zr_2O_7$+MPO_4 composite (M: rare earth metal)** as potential material for TBC for high temperature applications
- Development of phosphate composite based **low cost paint** to coat the **inner surface of turbocharger exhaust** as TBC material

Professional & Research Experience:

Research Intern, National Institute of Material Science, Tsukuba, Japan *May'13 – July'13*

Guide: Dr. Hideyuki Murakami, Group Leader, Surface Kinetics Group, High temperature Materials Unit

Project: *Development of γ-TiAl as thermal barrier coatings over Ti-alloys via pack-cementation process*

- **Developed γ-TiAl coating** over Ti-834 alloy via pack-cementation process using pre-alloyed Ni-Al powders and optimizing parameters like temperature, partial pressures and dwelling time

Vocational Trainee, Merchant Mill, TATA Steel, Jamshedpur, India *May'12 – June'12*

Guide: Dr. Gautam Mukherjee, Chief (Merchant Mill)

Project: *Reduction in variation in yield strength along the length of reinforcing bars*

- **Addressed a long standing problem** of non-uniform yield strength along the length of reinforcing bar
- Identified the **cause to be improper microstructure** of the pinch roll material being used to control the speed of rod while quenching and engineered a solution for the problem

Industrial Trainee, Casting Manufacturing Unit, Larsen & Toubro, Coimbatore, India *May'11 – June'11*

Guide: Dr. S. Sivakumar, Head of Research and Development

Project: Developing method for manufacturing of Riser-less SG iron castings for windmill applications

- Developed **a novel method** for manufacturing riser-less castings completely based on **optimization of metallurgical parameters** like pouring temperature, chiller placement, pouring time and composition

Projects:

Development of portable sensors for nanoscale concentration detection

Guide: Dr A. Subrahmanyam (Dept. of Physics, IIT Madras) *December'12 – September'13*

- Developed Surface enhanced Raman Spectroscopy as diagnostic tool for sensory applications
- Implemented use of **nanoparticle surface**(metals and biological cells) as receptor substrates

Synthesis of CuAlNi shape memory alloy via powder metallurgy route

Guide: Dr Lakshman N. (Dept. of Metallurgical and Materials Engineering, IIT Madras) *August'12 – November'12*

- Evaluated this preparation route against other standard processes like casting
- **Achieved reduction in preparation time** of alloy as compared to standard routes
- Investigated the temperature effects on sintering characteristics during spark plasma sintering

Simulation of oxygen and defect diffusion in YSZ

Guide: Dr Anand Kanjarla (Dept. of Metallurgical and Materials Engineering, IIT Madras) *August'13 – September'13*

- Modelled diffusion mechanism of oxygen in YSZ at different temp. and vacancy conc. using Bonn-Mayer potential

Finite element calculation of effective mechanical and thermal properties of multiphase materials

Guide: Dr Anand Kanjarla (Dept. of Metallurgical and Materials Engineering, IIT Madras) *October'13 – November'13*

Academic Distinctions:

- **NIMS Internship Program Fellowship:** Awarded by National Institute of Material Science (NIMS), Tsukuba, Japan to **70 students (out of 800)** globally for pursuing research in various areas of Material Science at NIMS *(May '13 – July '13)*

Conferences:

- Journée des doctorants de l'IEM 2015, Montpellier, France "Polymer-derived Ceramics and Nanocomposites for H_2 production from $NaBH_4$"
- JMJC 2015, Montpellier, France, "Polymer-Derived Ceramics and Nanocomposites for H_2 production from Chemical Hydrides"
- 91st DKG Annual Conference & Symposium on High-Performance Ceramics 2016, Freiberg, Germany, "Organosilicon Polymer-Derived Mesoporous 3D ceramics and nanocomposites for H_2 production from Chemical Hydrides"
- 8th International Workshop on Spinel Nitrides and Related Materials, Ruedesheim, Germany, "Polymer-derived silicon nitride-based nanocomposites as co-catalyst for hydrogen generation from chemical hydrides"
- Nanoworld 2017, Boston USA, "Multifunctional Nitride Nanocomposites Through Chemistry of Preceramic Polymers"

Courses:

- Science and Technology of Thin Films
- Science and Technology of Nano-material
- Surface Engineering
- Intro to Multi-scale modelling of materials
- Physics of Materials
- Physical Ceramics
- Smart Materials
- Numerical Methods for Metallurgists
- Creep, Fatigue and Fracture Mechanics
- Materials for Extreme Environments
- X-Ray Diffraction Techniques
- Molecular Architecture and Function
- Structure and Energetics of Biomolecules
- Spectroscopic applications in Organic and Inorganic Chemistry
- Corrosion Engineering

Language Proficiency:

- English
- Hindi
- Marathi
- French (A1 level)