<u>CV</u>

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Research interests:

I have ten years experience of synthesis and preparation of stable heterogeneous catalysts by confinement of metal complexes, nanocatalysts, and enzymes in nanoporous materials to synthesize fine chemicals during my post graduate and post-doctoral research at different laboratories in Japan, Sweden, and the Netherlands. My future research aim is to take advantage of my work experience at the interface of nanomaterial sciences, catalysis and organic chemistry to make industrially relevant heterogeneous catalysts to synthesize important organic chemicals by heterogenization of homogeneous catalysts in nanoreactors. To achieve my goals I will investigate and integrate the following research directions:

-Rational synthesis of nanostructured materials (nanoreactors) for confinement of homogeneous catalysts and for separation applications

-Confinement of homogeneous catalysts e.g., organometallic complexes, enzymes and colloidal nanoparticles in nanoporous materials to obtain stable heterogeneous catalysts -Structure-activity and -stability investigation of confined catalysts in challenging reactions

-Introduction of methodologies in confinement of catalysts in nanoporous materials -Combining heterogenized homogeneous catalysts and flow chemistry to synthesize important organic compounds

Work experience:

Sep. 2014-Jun. 2015

Lecturer

Department of Chemistry, Shahid Beheshti University, Tehran, Iran

Courses taught: 1- General Chemistry 2- Corrosion Engineering 3- Kinetic of Catalytic Reactions 4- Industrial Catalysis

2011-2013

Postdoctoral fellow

Inorganic Chemistry and Catalysis, Debye Institute for Nanomaterials Science, Utrecht University, the Netherlands

(Co)Supervisors: Prof. Krijn de Jong, Prof. Bert Klein Gebbink, and Prof. Petra de Jongh

Research theme: Nano-reactors for homogeneous catalysis: studying, synthesis and

characterization of nanoporous materials to confine metal complexes for organic chemical synthesis.

Duties:

- Synthesis and characterization of nanoporous materials for adsorption/catalysis applications.
- Confinement study of metal complexes and nanoparticles in nanoporous materials.
- Study of catalytic reactions of the heterogeneous metal complexes.
- Co-supervision of two Ph.D. and a B.Sc. student.
- Contact person and team player to mediate collaboration of inorganic chemistry and catalysis group with organic chemistry and catalysis group.

2008-2010

Postdoctoral fellow

Department of Organic Chemistry, Stockholm University, Sweden.

Supervisor: Prof. Jan-Erling Backvall

Research theme: Preparation stable heterogeneous metal nanocatalysts and enzymes for dynamic kinetic resolution of chiral organic compounds.

Duties:

- Synthesis and characterization of support nanoporous materials.
- Confinement and stability study of enzymes in nanoporous materials.
- Synthesis of supported metal nanocatalyts for racemization of amines.
- Optimization of the reaction conditions for synthesis of chiral β -amino esters.
- Collaboration with the INTENANT Project for racemization study of a drug http://cordis.europa.eu/result/report/rcn/45395_en.html
- Contact person and team player to mediate collaboration between organic chemistry and nanomaterials laboratories at Stockholm University.

2007-2008

Postdoctoral fellow

Department of Chemical Engineering, Kyushu University, Japan.

Supervisor: Prof. Koei Kawakami

Research theme: Confinement of lipases in nanoporous materials to make active catalysts for fine chemical synthesis.

Duties:

- Synthesis and characterization of nanoporous materials .
- Immobilization study of the biocatalyst of lipases in nanoporous materials.
- Optimization of biocatalytic reactions in both organic and ionic liquids solvents.
- Co-supervision of a M.Sc. student.

Education:

2004-2007

Ph.D. Environmental Chemistry & Engineering

Dep. Environmental Chemistry & Engineering, Tokyo Institute of Technology, Japan **Supervisor:** Prof. Makoto Shoda

Thesis title: Production of recombinant dye-decolorizing peroxidase (rDyP) and dye decolorization by free and immobilized rDyP.

Duties:

- Production of the biocatalyst of rDyP through fermentation process.
- Immobilization of the obtained enzymes in nanoporous materials by collaboration with heterogeneous catalysis laboratory of Prof. Iwamoto Masakusa.
- Application study of the immobilized and free enzymes performances in bioremediation of colored wastewater.
- Writing the manuscripts.

1999-2001

M.Sc. Chemical-Biotechnology Engineering

Sharif University of Technology, Tehran, Iran Thesis title: Coupled anaerobic baffled reactor (ABR)/activated sludge reactor for treatment of synthetic wastewater containing high concentration of sulfate and COD. Advisor: Prof. Manochehr Vossoughi

1995-1999

B.Sc. Chemical Engineering

Sahand University of Technology, Tabriz, Iran.

<u> 1991-1995</u>

Diploma Physics and Mathematics

School for Talented Students, Sheikh Shaltout High School, Kurdistan, Sananadaj, Iran.

Technical and experimental Skills:

- Highly multi-skilled due to working on multidisciplinary projects at the interface of organic chemistry, nanomaterials and catalysis laboratories.
- Experience in synthesis and characterization of nanostructure materials, organic compound synthesis, organometallic complexes and heterogeneous catalysts preparation.
- Highly experienced in optimization of reactions by chemical- and bio-catalysts.
- Experience in materials characterization using IR, X-ray, UV, NMR, gas physisorption, TGA, GC, HPLC.
- Hands-on experience in cell culture, fermentation, and enzyme purification using FPLC.

Scientific activities:

Reviewing papers for the journals of 1- Micropor. Mesopor. Mater. 2- J. Biochem .Eng. 3- J. Mol. Catal. B: Enzy. 4- RSC Advances 6- Chem. Commun.

Internship:

1999 Tabriz Petrochemical Company, Iran (3 months).

Honors and awards:

2003-2007 Japanese Governmental Scholarship.

Languages and communication skills:

- Kurdish (Native language), Persian (Excellent), English (Excellent) and some Japanese.
- Writing thesis, reports, and papers.
- Experienced in delivery of oral and written reports to academic audiences and peer reviewed journals, and weekly and monthly discussion of my projects.

Conferences attended:

-Annual Meeting, the Society for Biotechnology, Tsukuba, Japan, 2006 (talk)

- ISHHC XII: International Symposium on Relations between Homogeneous

and Heterogeneous Catalysis, Stockholm, Sweden, 2010

-NanoFormulation2010, Stockholm, Sweden

-National Conference on Catalysis, XII, the Netherlands, 2011

- National Conference on Catalysis, XIII, the Netherlands, 2012

- National Conference on Catalysis, XIV, the Netherlands, 2013

-North American Catalysis Society Meeting, 23rd, Louisville, Kentucky, USA 2013 (talk

by my co-supervisor),

-Europacat, XI, Lyon, France, 2013 (talk)

Invited talks:

-Iran Polymer and Petrochemical Institute, Tehran, 2014.

-Shahid Beheshti University, Tehran, 2014.

Publications (the most significant ones indicated with **):

- **Shakeri, M., Kelin Gebbink, R.J.M., de Jongh, P.E, de Jong, K.P. Tailoring the Window Sizes to Control Local Concentration and Activity of (salen)Co Catalysts in Plugged Nanochannels of SBA-15 Materials. *Angew. Chem. Int. Ed.* 2013, 52, 10854-10857. (*Impact factor = 13.734*)
- **Engstrom, K., Johnston, E.V., Verho, O., Gustafson, K.P.G., Shakeri, M., Tai, C.W., Backvall, J.E. Co-immobilization of an Enzyme and a Metal into the Compartments of Mesoporous Silica for Cooperative Tandem Catalysis: An Artificial Metalloenzyme. *Angew. Chem. Int. Ed*, 2013, 52, 14006-14010. (*Impact factor = 13.734*)
- **Shakeri, M., Roiban, L., Yazerski, V., Gonzalo, P., Klein Gebbink, R. J. M., de Jongh, P.E., de Jong, K.P. Engineering and Sizing Nanoreactors to Confine Metal Complexes for Enhanced Performance. *ACS Catalysis*, 2014. 4, 3791–3796 (*Impact factor = 7.572*)
- **Prieto, G., Shakeri, M., de Jong, K.P., de Jongh, P. E. Quantitative Relationship Between Support Porosity and the Stability of Pore-Confined Metal Nanoparticles studied on CuZnO/SiO2 Methanol Synthesis Catalysts, *ACS Nano*, 2014, 8, 2522–2531. (*Impact factor = 12.062*)
- 5. Oliveira, R. L., **Shakeri, M**., de Jongh, P.E, de Jong, K.P. Mapping nanocavities in plugged SBA-15 with confined silver nanostructures. *MicroMeso.Mater* submitted, **2013**. (*Impact factor = 3.414*)
- Shakeri, M., Kelin Gebbink, R.J.M., de Jongh, P.E., de Jong, K.P. Control and Assessment of Mesopores Plugging in SBA-15 Materials. *Micro. Meso. Mater.* 2013, 170, 340-345. (*Impact factor = 3.414*)
- Verho, O., Johnston, E., Kärkäs, M.D., Shakeri, M., Tai C.-w., Palmgren P., Oscarsson S., Bäckvall J.-E., Highly Dispersed Palladium Nanoparticles on Mesocellular Foam: An Efficient and Recyclable Heterogeneous Catalyst for Alcohol Oxidation, *Chem.-A Eur.J.*, 2012,18, 12202-12206. (*Impact factor = 5.831*)
- von Langermann J., Kaspereit M., Temmel E., Shakeri, M., Lorenz H., Hedberg M., Larson K., Herrschend, B., Jones, M., Arnell, R., Bäckvall, J.-E., Kienle A., Seidel-Morgenstern A. Design of an integrated process of Chromatography, Crystaliation, and Racemization for the resolution of 2',6'-Pipecoloxylidide (PPX). Org. Process Res. Dev. 2012, 16, 343-352. (Impact factor = 2.739)
- **Shakeri, M., Tai, C.W., Gothelid, E., Oscarssoon, S., Backvall. J.E. Small Pd Nanoparticles Supported in Large Pores of Mesocellular Foam: an Excellent Catalyst in Amine Racemization, *Chem.-A Eur. J.*, 2011, 27, 13269-13273. (*Impact factor = 5.831*)
- 10. **Engestrom, K., Shakeri, M.. Backval, J.E. Efficient dynamic kinetic resolution of β-amino esters by heterogeneous system of Pd nanoparticle and Candida antarctica lipase A. *Eur. J. Org. Chem.*, 2010, 1827-1830. (Engestrom and Shakeri have equal opportunity; Cover page). (*Impact factor = 3.344*)
- 11. ***Shakeri M**, Engestrom K. Sandstrom A, Backvall J.E. Highly enantioselective resolution of β -amino esters by *Candida antarctica* lipase A (CalA) immobilized

in mesocellular foam (MCF). Application to dynamic kinetic resolution. *ChemCatChem*, **2010**, 2, 534-538. (*Impact factor = 5.181*)

- 12. Shakeri M, Kawakami K. Significant change in transesterification activity of free and mesoporous-immobilized *Rhizopus oryzae* lipase in ionic liquids, *J. Biotechnol.*, 2010, 145, 281-283. (Impact factor = 3.183)
- Shakeri M, Shoda M. Efficient decolorization of an anthraquinone dye by recombinant dye-decolorizing peroxidase (rDyP) immobilized in silica-based mesocellular foam. J. Mol. Catal. B: Enzymatic, 2009, 62, 277-281. (Impact factor = 2.823)
- 14. Koei Kawakami, Ryo Takahashi, Mozaffar Shakeri and Shinji Sakai. Application of a lipase-immobilized silica monolith bioreactor to the production of fatty acid methyl esters. J. Mol. Cataly. B: Enzymatic. 57, 2009,194-197. (Impact factor = 2.823)
- 15. Shakeri M, Kawakami K. Enhancement of *Rhizopus oryzae* lipase activity immobilized on alkyl-functionalized spherical mesocellular foam: Influence of alkyl chain length, *Micro. Meso. Mater.* 2009, 118, 115-120. (*Impact factor = 3.414*)
- Shakeri, M., Kawakami, K. Effect of the structural chemical composition of mesoporous materials on the adsorption and activation of the *Rhizopus oryzae* lipase-catalyzed trans-esterification reaction in organic solvent. *Catal. Commun*, 2008, 10, 165-168. (*Impact factor = 2.915*)
- Shakeri, M., Sugano, Y., Shoda, M. Stable Repeated-batch Production of Recombinant Dye-decolorizing Peroxidase (rDyP) from Aspergillus oryzae . J. Biosci. Bioeng., 2008, 105, 683-686. (Impact factor = 1.737)
- Shakeri, M., Shoda, M. Decolrization of an anthraquinone dye by the recombinant dye-decolorizing peroxidase (rDyP) immobilized on mesoporous materials, *J. Mol. Catal. B: Enzymatic.* 2008, 54, 42-47. (*Impact factor = 2.823*)
- Shakeri, M., Shoda, M. Change in turnover capacity of crude recombinant dyedecolorizing peroxidase (rDyP) in batch and fed-batch decolorization of Remazol Brilliant Blue R. *Appl. Microbiol. Biotechnol.*, 2007, 76, 919-926. (*Impact factor =* 3.613)
- Shakeri, M., Sugano, Y., Shoda, M. Production of Dye-decolorizing Peroxidase (rDyP) Using Complex Substrates by Recombinant *Aspergillus oryzae* RD005 in Repeated-batch and Fed-batch Cultures. *J.Biosci. Bioeng.*, 2007, 103, 129-134. (Cover page) (*Impact factor = 1.737*)
- 21. Shakeri, M and Vossoughi, M. Coupled anaerobic baffled reactor (ABR)/activated sludge treatment of synthetic wastewater with high concentration of sulfate and COD. *Iranian J. of Eng.*, 2003, 16, 11-20.
- Vossoughi, M., Shakeri, M., Alemzadeh, I. Performance of anaerobic baffled reactor treating synthetic wastewater influenced by decreasing COD/SO₄ ratios. *Chem. Eng. Process.*, 2003, 42,811-816. (*Impact factor = 1.950*)

<u>References</u>

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