

## Debabrata Patra

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### Education:

**Ph.D. Department of Chemistry:** University of Massachusetts, Amherst, USA November, 2010

*Advisor: Prof. Vincent M. Rotello*

Thesis: "Colloidal Microcapsules: Surface Engineering of Nanoparticles for Interfacial Assembly".

**M.Sc. Department of Chemistry:** Indian Institute of Technology, Bombay, India, May, 2005

*Advisor: Prof. C. P. Rao*

Thesis: "Synthesis and characterization of glycosyl amine and their metal ion complexes".

**B.Sc. Chemistry (Honors):** Midnapore College, India. May, 2003

### Professional Experience:

**Postdoctoral Research:** Texas A&M University, College Station, Department of Mechanical Engineering.

*Advisor: Prof. Jaime C. Grunlan* April' 2013- Present

**Postdoctoral Research:** The Pennsylvania State University, University Park, Department of Chemistry.

*Advisor: Prof. Ayusman Sen* Jan' 2011-Feb' 2013

**Research Assistant:** Chemistry, University of Massachusetts, Amherst 2006-2010

**Teaching Assistant:** (Chem 111 Lab, Chem 112 Lab) 2005-2006

**Laboratory Mentoring:** Supervised graduate students to build their scientific insight and perspective in research.

**Team Work:** University of Massachusetts, Lowell, USA; Bogazici University, Istanbul, Turkey; University of Glasgow, Glasgow, UK.

### Research Experience:

#### **Doctoral Research @ Umass-Amherst:**

- Self-assembly of nanoparticles at liquid-liquid interface.
- Surface engineering of nanoparticles for interfacial assembly.
- Developed covalent and noncovalent chemical interactions between nanoparticles at oil-water interface to create stable emulsions and microporous capsules.
- Developed strategies to stabilize protein/nanoparticle complex at oil-water interface and designed catalytic microcapsules.
- Nanoparticle/polymer self-assembly.

#### **Postdoctoral Research @ Penn State**

- Synthesized supramolecular gel/coatings to fabricate stimuli responsive rechargeable micropump.
- Fabricated Self-powered enzyme micropumps.
- Designed enzyme powered nanomotors.

#### **Postdoctoral Research @ TAMU**

- Nanocoatings of polymer on PET, foams and fabric via layer-by-layer assembly.
- Polymer-polymer, polymer-clay nanocoatings for flame retardant application
- All Inorganic nanocoatings for fire insulation.
- Studying anti-flammable behavior of thin films.

### Skills:

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- **Synthesis:** Expertise in multistep organic synthesis and size selective nanoparticle synthesis (metallic e.g. Au, magnetic FePt/Fe<sub>3</sub>O<sub>4</sub> and semiconductor e.g. PbS/PbSe, CdSe).
- Hands on experience on nanoparticle surface engineering
- **Spectroscopy:** FTIR, NMR, UV-Vis, ISI-MS, Fluorescence
- **Microscopy:** Optical, Fluorescence, SEM, TEM, AFM, Image analysis.
- **Thermal Analysis:** TGA, DSC.
- **Flame Retardant Test:** Vertical and horizontal flame test for foam and fabric.
- **Others:** X-ray (SAXS), DLS, Zeta potential, Tensiometer, Ellipsometer, Quartz Crystal Microbalance (QCM).

### Awards:

- **Graduate Student Travel Grant Award** by University of Massachusetts (2010).
- **Joint Admission Test for M.Sc.** conducted by IITs (top 10%) (2005).
- **University Medal** for 1<sup>st</sup> Class in B.Sc.; Midnapore College, India (2003).
- **Birla Science Academy Award** (1995).
- **High School Scholarship** (1994).

### Publications:

- (21) Patra, D.; Vangal, P.; Grunlan, J. C. "All Inorganic Flame Retardant Multilayer Nanocoatings for Polyurethane from Aqueous Polyelectrolyte Solution" *Manuscript in Preparation*.
- (20) Sengupta, S. †; Patra, D. †; Rivera, I. O.; Agrawal, A.; Dey, K. K.; Shklyayev, S.; Mallouk, T. E.; Sen A. "Self-powered Enzyme Micropumps" *Nature Chemistry in review* ([† authors contribute equally](#)).
- (19) Patra, D.; Zhang, H.; Sengupta, S.; Sen, A. "Dual Stimuli-Responsive, Rechargeable Micropump via "Host-Guest" Interactions" *ACS Nano*, Article ASAP **2013**, DOI: 10.1021/nn402173w ([Highlighted in Chemistry World](#))
- (18) Patra, D.; Sengupta, S.; Duan, W.; Zhang, H.; Pavlick, R.; Sen, A. "Intelligent, Self-Powered Delivery Systems" *Nanoscale*, **2013**, 5, 1273-1283.
- (17) Jeong, Y.; Patra, D.; Sanyal, A.; Rotello V. M. "Fabrication of Stable Nanoparticle-Based Colloidal Microcapsules" *Curr. Org. Chem.*, **2013**, 17, 49-57.
- (16) Xi, Y.; Pham, J. T.; Subramani, C.; Creran, B.; Yeh, Y. C.; Du, K.; Patra, D.; Miranda, O. M.; Crosby A. J.; Rotello, V. M. "Direct Patterning of Engineered Ionic Gold Nanoparticles via Nanoimprint Lithography" Accepted in *Adv. Mater.*, **2012** (DOI: 10.1002/adma.201202776).
- (15) Abul-Kashem, M. M.; Patra, D.; Perlich, J.; Buffet, A.; Roth, S. V.; Rotello, V. M.; Muller-Buschbaum, P. "Two- and Three-dimensional Network of Nanoparticles via Polymer-Mediated Self-Assembly" *ACS Macro Lett.*, **2012**, 1, 396-399.
- (14) Rana, S.; Xi, Y. †; Patra, D. †; Moyano†, D. F.; Miranda, o. R.; Hussain, I.; Rotello, V. M. "Control of Surface Tension at Liquid-Liquid Interfaces Using Nanoparticles and Nanoparticle-Protein Complexes" *Langmuir*, **2012**, 28, 2023-2027. ([† authors contribute equally](#))
- (13) Yeh, Y. -C.; Patra, D.; Yan, B.; Saha, K.; Miranda, O. M.; Kim, C. K.; Rotello, V. M. "Synthesis of cationic quantum dots via a two-step ligand exchange process" *Chem. Commun.*, **2011**, 47, 3069-3071.
- (12) Patra, D.; Sanyal, A.; Rotello, V. M. "Colloidal Microcapsule: A Self-assembly Approach at Liquid-Liquid interface" *Chem. Asian J.*, **2010**, 5, 2442-2453.
- (11) Patra, D.; Malvankar, N.; Chin, E.; Tuominen, M.; Gu, Z.; Rotello, V. M. "Fabrication of Conductive Microcapsules via Self-assembly and Crosslinking of Gold Nanowires at Liquid-Liquid Interface" *Small*, **2010**, 6, 1402-1405.
- (10) Park, M.-H.; Duan, X.; Ofir, Y.; Creran, B.; Patra, D.; Ling, Y. X.; Huskens, J.; Rotello, V. M. "Chemically Directed Immobilization of Nanoparticles onto Gold Substrates for Orthogonal Assembly Using Dithiocarbamate Bond Formtion" *ACS Appl. Mater. Interface*, **2010**, 2, 795-799.

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- (9) Subramani, C.; Ofir, Y.; **Patra, D.**; Jordan, B. J.; Moran, I. W.; Park, M.-H.; Carter, K. R.; Rotello, V. M. "Nanoimprinted Polyethyleneimine: A Multimodal Template for Nanoparticle Assembly and Immobilization" *Adv. Funct. Mater.*, **2009**, *19*, 2937 - 2942.
- (8) **Patra, D.**; Pagliuca, C.; Subramani, C.; Samanta, B.; Agasti, S. S.; Zainalabdeen, N.; Caldwell, S. T.; Cooke, G.; Rotello, V. M. "Molecular recognition at the liquid-liquid interface of colloidal microcapsules" *Chem. Comm.* **2009**, *28*, 4248-4250.
- (7) **Patra, D.**; Ozdemir, F.; Miranda, O. R.; Samanta, B.; Sanyal, A.; Rotello, V. M. "Formation and Size Tuning of Colloidal Microcapsules via Host-Guest Molecular Recognition at the Liquid-Liquid Interface" *Langmuir*, **2009**, *25*, 13852-13854.
- (6) Samanta, B.; Yang, X.-C.; Ofir, Y.; Park, M.-H.; **Patra, D.**; Agasti, S. S.; Miranda, O. R.; Mo, Z.-H.; Rotello, V. M. "Catalytic Microcapsules Assembled from Enzyme-Nanoparticle Conjugates at Oil-Water Interfaces" *Angew. Chem. Int. Ed.*, **2009**, *48*, 5341-5344.
- (5) Samanta, B.; **Patra, D.**; Subramani, C.; Ofir, Y.; Yesilbag, G.; Sanyal, A.; Rotello, V. M. "Stable Magnetic Colloidosomes via "Click" Mediated Crosslinking of Nanoparticles at Water-oil Interfaces" *Small*, **2009**, *5*, 685-688.
- (4) Samanta, B.; Ofir, Y.; **Patra, D.**; Rotello, V. M. "Self-assembly of fluorocarbon-coated FePt nanoparticles for controlling structure and wettability of surfaces" *Soft Matter*, **2009**, *5*, 1247-1250.
- (3) Jordan, B. J.; Ofir, Y.; **Patra, D.**; Caldwell, S. T.; Kennedy, A.; Joubanian, S.; Rabani, G.; Cooke, G.; Rotello, V. M. "Controlled Self-Assembly of Organic Nanowires and Platelets Using Dipolar and Hydrogen-Bonding Interactions" *Small*, **2008**, *4*, 2074-2078.
- (2) Arumugam, P.; **Patra, D.**; Samanta, B.; Agasti, S. S.; Subramani, C.; Rotello, V. M. "Self-Assembly and Cross-linking of FePt Nanoparticles at Planar and Colloidal Liquid-Liquid Interfaces" *J. Am. Chem. Soc.*, **2008**, *130*, 10046-10047.
- (1) Xu, H.; Hong, R.; Wang, X.; Arvizo, R.; You, C.-C.; Samanta, B.; **Patra, D.**; Tuominen, M. T.; Rotello, V. M. "Controlled formation of patterned gold films via site-selective deposition of nanoparticles onto polymer-templated surfaces" *Adv. Mater.*, **2007**, *19*, 1383-1386.

### Technical Presentations (Selected):

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#### Poster Presentation

- (3) **Patra, D.**; Samanta, B.; Arumugam, P.; Rotello, V. M. "Fabrication of Colloidal Microcapsules by Self-assembly and Crosslinking of Nanoparticles at Liquid-Liquid Interface" Research Fest, Department of Chemistry, Umass Amherst, MA, **2009**.
- (2) **Patra, D.**; Samanta, B.; Arumugam, P.; Du, K.; Agasti, S.; Dinsmore, A.; Rotello, V. M. "Self-assembly of nanoparticles at liquid-liquid interfaces: A strategy toward generating stable colloidosomes and membranes" Abstracts of Papers, 236th ACS National Meeting, August 17-21, **2008**, Philadelphia, PA, United States.
- (1) **Patra, D.**; Srivastava, S.; Lu, T.; Samanta, B.; Rotello, V. M. "Controlled localization of FePt nanoparticles in block copolymers for modulation of magnetic properties" Abstracts of Papers, 234th ACS National Meeting, August 19-23, **2007**, Boston, MA, United States.

### References:

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