

# Bartłomiej Kowalczyk

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Research Associate  
Department of Chemical and Biological Engineering  
Northwestern University

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## Education:

*Post-Doctoral Fellow* (Nanoscience) Mar. 2006 – May 2008  
Northwestern University, Department of Chemical and Biological Engineering  
Research Area: Electrostatic Self-assembly in the Nanoscale, Nanomaterials, Functional Coatings, Self-Assembled Monolayers, Surface Chemistry, Organic Synthesis, Chemical Networks.

*Ph.D.* (Organic Chemistry) Dec. 2000 – Dec. 2005  
University of Warsaw, Department of Chemistry  
Research Area: Synthesis and Properties of Macrocyclic Polyazocoronands, Organic synthesis, Organocatalysis, Asymmetric Synthesis.

*M.S.* (Organic Chemistry) Sep. 1996 – Nov. 2000  
University of Warsaw, Department of Chemistry  
Research Area: Organic synthesis, Macromolecular Chemistry.

## Professional Appointment:

*Research Associate* (Nanoscience) May 2008 – onwards  
Northwestern University, Department of Chemical and Biological Engineering

*Post-Doctoral Fellow* (Nanoscience) Mar. 2006 – May 2008  
Northwestern University, Department of Chemical and Biological Engineering

*Research Associate* (Organic Chemistry) Mar. 2005 – Mar. 2006  
Polish Academy of Sciences, Institute of Organic Chemistry

*Ph.D. Student* (Organic Chemistry) Dec. 2000 – Dec. 2005  
Warsaw University, Department of Chemistry

*M.S. Student* (Organic/Supramolecular Chemistry) Sep. 1996 – Nov. 2000  
Warsaw University, Department of Chemistry

## Research Experience:

### Nanoscience/Organic Chemistry

2006 – onwards

- Synthesis, functionalization and assembly of noble metals nanoparticles, magnetic nanoparticles, semiconductor nanoparticles;
- Synthesis and characterization of self-assembled monolayers, bilayers and hydrophobic surfaces;
- Fabrication, transfer and patterning of mono- and multilayer free-standing thin films onto various surfaces;
- Surface chemistry, fabrication of functional nanoparticle coatings possessing antibacterial and/or antifungal properties;

### Organic Chemistry

2005 – 2006

- Design and synthesis of novel class of organocatalysts based on binaphthyldiamine backbone and various aminoacids;
- Application of previously synthesized organocatalysts in direct asymmetric aldol reaction;

### Organic/Supramolecular Chemistry

1996 – 2005

- Low- and high pressure synthesis of macrocyclic polyamides by macrocyclization of terminal diamines with dicarboxylates;
- Structural studies by X-ray crystallography of series isomeric macrocyclic bisamides and comparison of their complexing abilities;
- Measuring by NMR and UV titrations and by ESI MS techniques binding properties of macrocyclic polyamides;
- Synthesis of “hybrid” chiral macrocycles in which chirality is derived from combination of stereogenic center and C<sub>2</sub>-axis, or stereogenic center and plane;
- Contract work for couple of industrial companies including designing and performing multistep syntheses of various compounds (potential pesticides and insecticides, some drug candidates and others).

## Publications:

1. **Kowalczyk, B.**; Tarnowska, A.; Tarnowski, P.; Jurczak, J. "Synthesis and ESI-MS complexation studies of new macrocyclic bisamides containing binaphthyl unit", *Journal Incl. Phenom. Macro.*, **2004**, 91-95.
2. **Kowalczyk, B.**; Tarnowska, A.; Weselinski, L.; Jurczak, J. "The synthesis of homochiral hybrid diamines derived from 1,1'-binaphthyl-2,2'-diamine and  $\alpha$ -amino acids", *Synlett*, **2005**, 2373-2375.
3. Gryko, D.; **Kowalczyk, B.**; Zawadzki L. "Bisprolinediamides with the binaphthyl backbone as organocatalysts for the direct asymmetric aldol reaction", *Synlett*, **2006**, 1059-1062.
4. Kalsin, A.M.; **Kowalczyk, B.**; Smoukov, S.K.; Klajn, R.; Grzybowski, B.A. "Ionic-like behavior of oppositely charged nanoparticles", *J. Am. Chem. Soc.*, **2006**, 15046-15047.

5. Kalsin, A.M.; **Kowalczyk, B.**; Wesson, P.; Paszewski M.P.; Grzybowski, B.A. "Studying the thermodynamics of surface reactions on nanoparticles by electrostatic titrations", *J. Am. Chem. Soc.*, **2007**; 129 (21), 6664-6665.
  6. Pinchuk, A.O.; Kalsin, A.M.; **Kowalczyk, B.**; Schatz G.C.; Grzybowski, B.A. "Modeling of electrodynamic interactions between metal nanoparticles aggregated by electrostatic interactions into closely-packed clusters.", *J. Phys. Chem. C.*, **2007**, 11816-11822.
  7. Smoukov, S.K.; Bishop, K.J.M.; **Kowalczyk, B.**; Kalsin, A.M.; Grzybowski, B.A. "Electrostatically "patchy" coatings via cooperative adsorption of charged nanoparticles", *J. Am. Chem. Soc.*, **2007**, 15623-15630
  8. Bishop, K.J.M.; **Kowalczyk, B.**; Grzybowski, B.A. "Precipitation of oppositely charged nanoparticles by dilution and/or temperature increase", *J. Phys. Chem. B.*, **2009**, 113, 1413-1417
  9. **Kowalczyk, B.**; Kalsin, A. M.; Orlik, R.; Bishop, K. J. M.; Patashinskii, A. Z.; Mitus, A.; Grzybowski, B. A. "Size-selection during crystallization of oppositely charged nanoparticles", *Chem. Eur. J.*, **2009**, 15, 2032-2035 (*cover art*)
  10. **Kowalczyk, B.**; Byrska, M.; Mahmud, G.; Huda, S.; Kandere-Grzybowska, K.; Grzybowski, B.A., "Nanoparticle based, solution deposition of gold films supporting bioresistant SAMs", *Langmuir*, 2009, accepted
  11. Tretiakov, K. V.; Bishop, K.J.M.; **Kowalczyk, B.**; Jaiswal, A.; Poggi, M.A.; Grzybowski, B.A. „Mechanism of the cooperative adsorption of oppositely charged nanoparticles", *J. Phys. Chem. B.*, 2009, accepted
  12. **Kowalczyk, B.**; Bishop, K.J.M.; Smoukov, S.K.; Grzybowski, B.A. "Synthetic popularity reflects chemical reactivity", *J. Phys. Org. Chem.*, 2009, accepted
  13. Grzybowski, B.A.; Bishop, K.J.M.; **Kowalczyk, B.**; Wilmer, C. "The 'wired' universe of organic chemistry", *Nature Chemistry*, 2009, accepted
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14. Nakanishi, H.; Bishop, K.J.M.; **Kowalczyk, B.**; Nitzan, A.; Tretiakov, K.V.; Apodaca, M.M.; Weiss, E.; Klajn, R.; Stoddart, J.F.; Grzybowski, B.A. "Photoconductance and inverse photoconductance in thin films of functionalized metal nanoparticles", submitted.
  15. Orlik, R.; Mitus, A.C.; **Kowalczyk, B.**; Patashinski, A.Z.; Grzybowski, B.A., "Computer Simulation of Self-Assembly (Crystallization) of Oppositely Charged Nanoparticles with Various Size Distributions", submitted
  16. Huda, S.; Smoukov, S.K.; Nakanishi, H.; **Kowalczyk, B.**; Grzybowski, B.A. "Antimicrobial monolayers of silver nanoparticles prepared by cooperative electrostatic adsorption", submitted
  17. **Kowalczyk, B.**; Apodaca, M.M.; Smoukov, S.K.; Nakanishi, H. "Lift-off and Micropatterning of Mono- and Multilayer Nanoparticle Films", submitted

### **Patents:**

1. Smoukov, S.K.; Bishop, K.J.M.; **Kowalczyk, B.**; Kalsin, A.M.; Grzybowski, B.A. “Electrostatically “patchy” coatings via cooperative adsorption of charged nanoparticles”, **2007**, *Patent#*: US60/970,689.

### **Conference presentations and posters:**

1. **Bartłomiej Kowalczyk**, Aldona Tarnowska, Janusz Jurczak, “Synthesis and complexation properties of macrocyclic ligands containing binaphthyl unit” (*poster*). *XXVIII International Symposium on Macrocyclic Chemistry*, Gdansk, Poland, **2003**.
2. **Bartłomiej Kowalczyk**, Aldona Tarnowska, Lukasz Weselinski, Janusz Jurczak “Synthesis of homochiral hybrid diamines from 1,1'-binaphthyl-2,2'-diamine and  $\alpha$ -aminoacids” (*oral presentation and poster*). *5<sup>th</sup> International School of Molecular Catalysis*, Poznan, Poland, **2005**.

### **Honors and Awards:**

Fellowship of the Polish Science Foundation (2001)

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