

# Sabiruddin Mirza, PhD

9 Oxford Street, McKay Laboratory 517, Cambridge, MA 02138  
Phone: (857) 222-6475, email: [sabir@seas.harvard.edu](mailto:sabir@seas.harvard.edu)



**HARVARD**  
School of Engineering  
and Applied Sciences

## Current Position

Nov 2010 – **Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
Present *Research Fellow in Nanotechnology*

## Education & Academic Titles

May 2010 **University of Helsinki** Helsinki,  
Finland *Docent (equivalent of Adjunct Professor) in Physical Pharmacy*

Oct 2007 **University of Helsinki** Helsinki,  
Finland *Ph.D. in Pharmaceutical Technology*

- Thesis Title: ‘Crystallization as a tool for controlling and designing properties of pharmaceutical solids’
- Supervisors: Professors Jouko Yliruusi & Jukka Rantanen

May 1994 **Ukrainian Pharmaceutical Academy** Kharkov, Ukraine  
*M. Sc. in Pharmacy*

- Thesis Title: ‘Synthesis, Structure and Biological Activities of 2-Methyl 5-Nitro Succinanylic Acid Derivatives’

## Awards

2008 The American Association of Pharmaceutical Scientists (AAPS) -  
*Outstanding Graduate Research Award in Pharmaceutical Technologies, Atlanta, GA*

2008 The Best Poster Award - 19<sup>th</sup> Helsinki Drug Research, Helsinki, Finland

2004 Orion Pharma Innovator Award, Espoo, Finland

## Research Grants & Fellowships

2010-2012 Academy of Finland - Postdoctoral Research Grant (PI) € 334,000

2009-2012 Estonian Research Council – Estonian-Finnish Joint Research project (co-PI) EEK 850 000

2004 Finnish Pharmaceutical Society - Postgraduate Research Grant € 6,000

2003 Centre for International Mobility (CIMO, Finland) research € 9,600

## Teaching Experience

**University of Helsinki - Faculty of Pharmacy** Helsinki, Finland

Since 2008 *Solid-State Analysis of Pharmaceutics (lectures for Pharm.D./Ph.D. students)*

- Designed and developed course curriculum
- Prepared and delivered lectures as well as e-learning materials
- Moderated and facilitated classroom discussions
- Assessed students’ home and project assignments

2005-2007 *Dosage Form Development (laboratory for Pharm.D. students)*

- Designed and delivered laboratory instructions
- Coached students in advanced formulation techniques such as solid dispersions,

- microemulsions, nanoparticles, and nanocrystals
- Developed and evaluated problem sets
- 2006 *Pharmaceutical Compounding (laboratory for B.Pharm. students)*
- Prepared and delivered pre-laboratory instructions and seminars
  - Guided and supervised students in various compounding procedures for solid, semisolid, liquid and soft dosage forms as well as parenteral aseptic preparations
  - Addressed individual students' questions and needs
  - Evaluated and graded students' laboratory performance

### Supervising & Mentoring

Since 2011 **Harvard University** - School of Engineering and Applied Sciences, Cambridge, USA

- *Undergraduate students*: Li Sun, Jilian Lee, Katarina Williamson
- *M.Sc. candidate*: Jenni Pesi, Allison Halleck
- *Ph.D. candidates*: Barbara Herranz, Melaku Muluneh

2005-2010 **University of Helsinki** - Faculty of Pharmacy, Helsinki, Finland

- *Undergraduate students*: Tomaszewicz Bartosz, Gutierrez Rubio Miguel, Säde Keinänen, Vilma Vallenius
- *M.Sc. candidates*: Andrei Krasnov, Jordane Richez, Marina Sihancova, Geertrui Tavernier, Bahdori Tadjmohammad, Sabrina Trows
- *Ph.D. candidate*: Natalia Genina, Gelsys Gonzalez, Anna Shevchenko

### Research Interests

Nanomedicines, drug delivery systems, combination drugs, multifunctional nanocarriers, biomaterials, surface modification, nanocrystals, solid form screening, cocrystals, materials analysis, preformulation, preclinical drug development screens, microfluidics

### Other Professional Experience

Mar 2007 –	University of Helsinki, Centre for Drug Research	Helsinki, Finland
Oct 2010	<i>Postdoctoral Fellow in Nanotechnology and Biomaterials</i>	
May 1996 –	Square Pharmaceuticals Ltd. - Moscow Representative Office	Moscow, Russia
Aug 1999	<i>Country Manager</i>	
Aug 1994 –	Beximco Pharmaceuticals Ltd.	Dhaka, Bangladesh
Apr 1996	<i>Production Pharmacist</i>	

### Leadership

2007-2008 The President of Bangladeshi Academic Forum (BAFU) at the University of Helsinki  
 2007-2009 International Students Advisor at the Faculty of Pharmacy, University of Helsinki

### Memberships and Affiliations

- American Association for Cancer Research (since 2013)

- American Association of Pharmaceutical Scientists (since 2001)
- American Society of Mechanical Engineers (since 2013)
- Control Release Society (since 2009)
- Finnish Association of Pharmacy Teachers & Researchers (since 2001)
- Finnish Pharmaceutical Society (since 2002)
- Finnish Society of Physical Pharmacy (since 2003)

### Professional and Career Development Training

- |  |             |
|--|-------------|
| • Introduction to Innovation and Entrepreneurship – <i>Harvard Business School</i> | Spring 2013 |
| • Responsible Conduct of Research – <i>Harvard University</i>                      | Jan 2013    |
| • Academic Supervising (5 credits) - <i>University of Helsinki</i>                 | Fall 2009   |

### Other Academic Activities

- Editorial Board Member of ISRN Medicinal Chemistry
- *Ad hoc Reviewer:*
  - AAPS PharmSci
  - Chemical Engineering and Technology
  - Crystal Growth & Design
  - Drug Development and Industrial Pharmacy
  - European Journal of Pharmaceutical Sciences
  - European Journal of Pharmaceutical and Biopharmaceutical Analysis
  - International Journal of Pharmaceutics
  - Journal of Pharmaceutical Science
  - Journal of Pharmaceutical and Biomedical Analysis
  - Journal of Pharmacy and Pharmacology

### Language Skills

- |           |               |
|-----------|---------------|
| • English | Excellent     |
| • Bengali | Mother tongue |
| • Hindi   | Good          |
| • Russian | Excellent     |
| • Finnish | Satisfactory  |

### Presentations (\*invited)

Microfluidic fabrication of polycaprolactone microspheres for enhanced protein drug delivery. 53rd New England Complex Fluids Workshop, November 30, 2012, Cambridge, MA USA.

Microfluidic synthesis of pharmaceutical cocrystals. 50th New England Complex Fluids Workshop, March 28, 2012, Yale University, CT, USA.

\*Polymeric Additives as Crystal Habit Modifiers of API. 17th Larson Workshop of the Association for Crystallization Technology, October 3-6, 2012, Piscataway, NJ, USA.

\*Co-crystallization as a pathway to pharmaceutical designer solids. 6th International Scientific Conference on Kinetics and Mechanisms of Crystallization: Self-organization at Phase Formation, September 21-24, 2010, Ivanovo, Russia.

Additive-Induced Crystallization as a Tool for Tailoring Tableting Performance of Pharmaceutical Materials. European Symposium on Comminution and Classification (ESCC) 2009, September 15-18, Espoo, Finland.

\*Co-crystals: an emerging approach to improving properties of pharmaceutical solids. 19th Helsinki Drug Research, June 9-11, 2008, Helsinki, Finland.

Thermally-Induced Phase Transformations of Erythromycin Dihydrate. PAT-KIVA Seminar, May 2008, University of Helsinki, Finland.

Optical Microscopy as a Tool for Probing Solvent-Mediated Transformations of Pharmaceutical Solids. SCANDEM 2007, June 18-20, Espoo, Finland.

\*Modification of Erythromycin by Solid Dispersions and Crystal Engineering. Society of Physical Pharmacy XVI Symposium (January 21-22, 2005, Helsinki, Finland).

## Publications

### (I) Articles in Peer-Reviewed Scientific Journals:

1. B Herranz-Blanco,<sup>a</sup> L Arriaga,<sup>b</sup> E. Mäkilä,<sup>c</sup> S. **Mirza**,<sup>ab</sup> David A. Weitz,<sup>b</sup> Jarno Salonen,<sup>c</sup> Jouni T. Hirvonen,<sup>a</sup> and Hélder A. Santos, 2013 Microfluidic Assembly of Multistage Porous Silicon/Lipid Vesicles for Controlled Drug Release. accepted, Lab on a Chip
1. **Mirza** S, Miroshnyk I, Weitz D. 2014. Biphasic Microemulsion Formulations of 5-Fluorouracil and Curcumin for Colon-Targeted Cancer Therapy (manuscript in preparation).
2. Miroshnyk I, Throws S, Santos H, Peltonen L, Yliruusi J, **Mirza** S. 2014. Exploiting Thermodynamic Properties of Cofomers to Facilitate Design of Pharmaceutical Cocrystals with Enhanced Dissolution Rate, submitted.
3. Shevchenko A, Miroshnyk I, Pietilä L-O, Haarala J, Salmia J, Sinervo K, **Mirza** S, van Veen B, Kolehmainen E, Nonappa N, Yliruusi J. 2013. Diversity in Itraconazole Cocrystals with Aliphatic Dicarboxylic Acids of Varying Chain Length, *Crystal Growth & Design*, DOI: 10.1021/cg401061
4. Liu D, Herranz B, Mäkilä E, Kaasalainen M, Arriaga L, **Mirza** S, Weitz DA, Salonen J, Hirvonen J, Santos HA. 2013. Microfluidic Templated Mesoporous Silicon Solid Lipid Microcomposites for Sustained Drug Delivery, *ACS Appl. Mater. Interfaces*, 5 (22), pp 12127–12134.
5. Li Y-C, Rissanen S, Stepniowski M, **Mirza** S, Cramariuc O, Róg T, Xhaard H, Wytrwal M, Kepczynski M, Bunker A. 2012. Study of Interaction between PEG Carrier and 3 Relevant Drug Molecules: Piroxicam, Paclitaxel, and Hematoporphyrin. *J Phys Chem B*. 116, 24, p. 7334-7341.
6. Paaver U, Lust A, **Mirza** S, Rantanen J, Veski P, Heinämäki J, Kogermann K. 2012. Insight in to the solubility and dissolution behavior of piroxicam anhydrate and monohydrate forms. *Int. J. Pharm.* 431, 1-2, 111-119.

7. **Mirza S**, Miroshnyk I, Habib MJ, Brausch JF, Hussain MD. Enhanced dissolution and oral bioavailability of piroxicam formulations: modulating effect of phospholipids. *Pharmaceutics* 2010, 2, 339-350.
8. Karlina M, Pozharitskaya O, Shikov A, Makarov V, **Mirza S**, Miroshnyk I. & Hiltunen R. Biopharmaceutical study of nanosystems containing betulin for inhalation administration. *Pharm Chem J.* 2010, 4, 9, 501-503.
9. Miroshnyk I, **Mirza S**. 2010. Capturing the advantages of co-crystals. *Pharm Tech Eur*, 22 (7), 31-35.
10. Miroshnyk I, **Mirza S**, Sandler N. 2009. Pharmaceutical co-crystals – an opportunity for drug product enhancement. *Expert Opin Drug Deliv*, 6(4), 333-41.
11. Shikov AN, Pozharitskaya ON, Miroshnyk I, **Mirza S**, Urakova IN, Hirsjärvi S, Makarov VG, Heinämäki J, Yliruusi J, Hiltunen R. 2009. Nanodispersions of taxifolin: impact of solid-state properties on dissolution behavior. *Int. J. Pharm.* 377(1-2):148-152.
12. Aaltonen J, Allesø M, **Mirza S**, Koradia V, Gordon KC, Rantanen J. 2009. Solid form screening - a review. *Eur J Pharm Biopharm.* 71(1) 23–37.
13. **Mirza S**, Miroshnyk I, Heinämäki J, Rantanen J, Antikainen O, Vuorela P, Vuorela H, Yliruusi J. 2009. Crystal Morphology Engineering of Pharmaceutical Solids: Tableting Performance Enhancement. *AAPS PharmSciTech*, 10(1), 113-9.
14. Shikov AN, Pozharitskaya ON, Miroshnyk I, **Mirza S**, Karlina MV, Hirsjärvi S, Makarov VG, Tihonov VP, Hiltunen R. 2008. Nanosystems as a tool for enhancing bioavailability of natural compounds. 2008. *Pharmacia* 7:53-57.
15. **Mirza S**, Miroshnyk I, Heinämäki J, Rantanen J, Antikainen O, Vuorela P, Vuorela H, Yliruusi J. 2008. Hydroxypropyl methylcellulose-controlled crystallization of erythromycin A dihydrate crystals with modified morphology. *Cryst Growth Des*, 8(10), 3526–3531.
16. Miroshnyk I, **Mirza S**, Zorky PM, Heinämäki J, Yli-Kauhaluoma J, Yliruusi J. 2008. A New Insight into Solid-State Conformation of Macrolide Antibiotics. *Bioorg. Med. Chem.* 16 (1), 232-239.
17. **Mirza S**, Miroshnyk I, Heinämäki J, Yliruusi J. 2008. Co-crystals: an emerging approach to enhancing properties of pharmaceutical solids. *Dosis* 24 (2), 90-96.
18. Perlovich GL, Hansen LK, Volkova TV, **Mirza S**, Manin AN, Bauer-Brandl A. 2007. Thermodynamic and structural aspects of hydrated and unhydrated phases of 4-hydroxy-benzamide. *Crystal Growth & Design*: 7(12): 2643-2648.
19. **Mirza S**, Miroshnyk I, Rantanen J, Aaltonen J, Harjula P, Kiljunen E, Heinämäki J, Yliruusi J. Solid-state properties and relationship between anhydrate and monohydrate of baclofen. 2007. *J. Pharm. Sci.* 96:2399–2408.
20. Miroshnyk I, Khriachtchev L, **Mirza S**, Rantanen J, Heinämäki J, Yliruusi J. 2006. Insight into thermally induced phase transformations of erythromycin A dihydrate. *Crystal Growth & Design* 6: 369–374.
21. **Mirza S**, Heinämäki J, Miroshnyk I, Rantanen J, Christiansen L, Karjalainen M, Yliruusi J. 2006. Understanding processing-induced phase transformations in erythromycin-PEG 6000 solid dispersions. *J. Pharm. Sci.* 95(8):1723-1732.
22. Novoa GAG, Heinämäki J, **Mirza S**, Antikainen O, Iraizoz CA, Suzarte PA, Yliruusi J. 2005. Physical solid-state properties and dissolution of sustained-release matrices of polyvinylacetate. *Eur. J. Pharm. Biopharm.* 59(2), 343-350.
23. **Mirza S**, Miroshnyk I, Heinämäki J, Christiansen L, Karjalainen M, Yliruusi J. Influence of solvents on the variety of crystalline forms of erythromycin. *PharmSci* (2003), 5(2).

## (II) Conference Proceedings:

1. **Mirza S**, Miroshnyk I, Weitz D. 2012. Encapsulation of 5-Fluorouracil for Controlled Release: Microfluidic Chip Based Approach. 1st International conference on Frontiers in Pharmaceutical Sciences: Global Perspectives. September 28, 2012, Kingston, RI, USA.
2. Williamson K A, **Mirza S**, Marks WH, Bhatia SK. Hydrogels for optimizing localized delivery of non-steroidal anti-inflammatory drugs and preventing skin cancer. 1st International conference on Frontiers in Pharmaceutical Sciences: Global Perspectives. September 28, 2012, Kingston, RI, USA.
3. **Mirza S**, Miroshnyk I, Hossain MD & Weitz D. Microfluidic technology as a versatile platform for fabrication of nanomedicines. Annual Meeting of American Association of Bangladeshi Pharmaceutical Scientists, October 23, 2011, Washington, MA, USA.
4. Ali S, Langley N, Djuric D, Kotler K, **Mirza S**. Electrospinning for Solid Dispersions of a Poorly Soluble Drug, 38th Annual Meeting & Exposition of the Controlled Release Society, July 30 - August 3, 2011, Maryland, USA.
5. **Mirza S**, Miroshnyk I, Mohammadi S, Hussain M, Yli-Kauhaluoma J, Urtti A. Electrospinning platform for fabrication of monodispersed nanoparticles for pharmaceutical applications. The AAPS Journal. 2010; 12(S2).
6. Paaver U, **Mirza S**, Veski P, Rantanen J, Kogermann K. Investigation of piroxicam dissolution behavior in the presence of excipients under various testing environments. The AAPS Journal. 2010; 12(S2).
7. Miroshnyk I, Trows S, Santos H, Peltonen L, Heinämäki J, Hussain MD, Yliruusi J, **Mirza S**. Linking Dissolution Rate of Ibuprofen-Nicotinamide Cocrystals to Thermodynamic Properties of the Cofomers. 37th Annual Meeting and Exposition of the Controlled Release Society (CRS), July 10-14, 2010, Portland, Oregon, USA.
8. Miroshnyk I, Liu P, Hussain M, Yliruusi J, **Mirza S**. Nanococrystals as a formulation alternative for poorly soluble APIs. The AAPS Journal. 2010; 12(S3).
9. **Mirza S**, Miroshnyk I, Trows S, Santos H, Peltonen L, Sandler N, Heinämäki J, Yliruusi J. Cocrystal Approach to Dissolution Rate Modulation of Active Pharmaceutical Ingredients. European Symposium on Comminution and Classification (ESCC) 2009, September 15-18, Espoo, Finland. Electronical Proceedings (CD-Rom) of the European Symposium on Comminution and Classification.
10. Miroshnyk I, Heinämäki J, **Mirza S**, Vuorela P, Vuorela H, Yliruusi J. Cellulose acetate phthalate as carrier polymer for amorphous dispersions with enhanced acidic stability. Proceedings of the 6th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology, Barcelona, Spain, April 7-10, 2008.
11. **Mirza S**, Miroshnyk I, Heinämäki J, Yliruusi J. Co-crystals: an emerging approach to improving properties of pharmaceutical solids. 19th Helsinki Drug Research, June 9-11, 2008, Helsinki, Finland.

### (III) Poster Presentations:

1. **Mirza S**, Miroshnyk I, Herranz-Blanco B, Weitz D, Santos HA. Continuous microfluidic platform for encapsulation of mesoporous nanocarriers for cancer drug delivery. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition, 10-14 November 2013, San Antonio, TX, USA.

2. Miroshnyk I, Alakurtti S, Yli-Kauhaluoma J, Weitz D, **Mirza S**. Microfluidic Engineering of Noninvasive Delivery Systems for Combination Cancer Therapies. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition, 10-14 November 2013, San Antonio, TX, USA.
3. Herranz B, Liu D, Arriaga L, **Mirza S**, Weitz D, Santos HA. Mesoporous silicon-solid lipid composited nanocarriers prepared via microfluidic technique for drug delivery applications, 25th European Conference on Biomaterials, 8-12 September 2013, Madrid, Spain.
4. **Mirza S**, Miroshnyk I, S.H. Kim, Weitz D. Microfluidic Fabrication of Sustained Release Microcapsules for Cancer Therapy. The AAPS Annual Meeting and Exposition, October 14-18, 2012, Chicago, MI, USA.
5. Miroshnyk I, **Mirza S**, Richez J, Heinämäki J, Sandler N. Pharmaceutical cocrystals: assessment of processing performance. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition, November 8-12, 2009, Los Angeles, California, USA. The AAPS Journal. 2009; 11(S2).
6. **Mirza S**, Miroshnyk I, Trows S, Santos H, Peltonen L, Heinämäki J, Yliruusi J. Solid-Phase Behavior of Indomethacin-Nicotinamide Cocrystals During Dissolution. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition, November 8-12, 2009, Los Angeles, California, USA.
7. **Mirza S**, Miroshnyk I, Trows S, Santos H, Peltonen L, Sandler N, Heinämäki J, Yliruusi J. Pharmaceutical co-crystals as molecular-based platform for dissolution rate enhancement of drugs, 2<sup>nd</sup> PharmSciFair, June 8-12, 2009, Nice, France.
8. Miroshnyk I, Heinämäki J, **Mirza S**, Vuorela P, Vuorela H, Yliruusi J. Amorphous solid dispersions of erythromycin A with enhanced acidic stability. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, Georgia, USA.
9. Miroshnyk I, **Mirza S**, Heinämäki J, Aaltonen J, Yliruusi J. Retarding the kinetics of hydrate formation via excipient-mediated crystallization. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, GA, USA.
10. Miroshnyk I, **Mirza S**, Rantanen J, Heinämäki J, Yliruusi J. Raman spectroscopy as a tool for detecting isomorphic solid phase transformations. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, GA, USA.
11. **Mirza S**, Miroshnyk I, Peltonen L, Heinämäki J, Yliruusi J. Enhancing dissolution rate of poorly soluble drugs: cocrystal approach. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, Georgia, USA.
12. **Mirza S**, Miroshnyk I, Krasnov A, Heinämäki J, Yliruusi J. Cocrystals: controlling solvent-mediated phase transformations during wet granulation. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, GA, USA.
13. **Mirza S**, Miroshnyk I, Heinämäki J, Antikainen O, Rantanen J, Vuorela P, Vuorela H, Yliruusi J. Crystal morphology engineering of pharmaceutical solids: tableting performance enhancement. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, Georgia, USA.
14. **Mirza S**, Miroshnyk I, Alakurtti S, Yli-Kauhaluoma J, Heinämäki J, Yliruusi J. Polymorph screening: effect of solvent on phase transformation behavior of betulin. American Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, Georgia, USA.

15. Shikov AN, **Mirza S**, Miroshnyk I, Pozharitskaya ON, Urakova IN, Hirsjärvi S, Makarov VG, Heinämäki J, Yliruusi J, Hiltunen R. Freeze-dried nanoparticles for dissolution rate enhancement of poorly water soluble drugs: the case of taxifolin. Association of Pharmaceutical Scientists (AAPS) Annual Meeting and Exposition. November 16-20, 2008, Atlanta, Georgia, USA.
16. **Mirza S**, Miroshnyk I, Heinämäki J, Rantanen J, Christiansen L, Yliruusi J. 2005. Modification of Erythromycin by Solid Dispersions and Crystal Engineering. Society of Physical Pharmacy XVI Symposium. January 21-22, 2005, Helsinki, Finland.

**(IV) Theses**

**Mirza S**. Synthesis, Structure and Biological Activities of 2-Methyl 5-ito Succinanylic Acid Derivatives. 1994. Master's Thesis, Ukrainian Pharmaceutical Academy, Kharkov, Ukraine.

**Mirza S**. Crystallization as a tool for controlling and designing properties of pharmaceutical solids. 2007. Ph.D. Thesis, Helsinki University Printing House, Helsinki, Finland, 64 p.

**(V) Audiovisual material**

**Mirza S**. Advances in Pharmaceutical Nanotechnologies to Combat Cancer (in Bengali). TV-Interview, ATN-Bangla, Positive Bangladesh, May 12, 2012.