

Keith Chadwick

Purdue University
Department of Industrial and Physical Pharmacy
575 Stadium Mall Drive 308B
West Lafayette, IN 47907
Email: chadwick@purdue.edu

Education

- Ph.D.** University of Manchester, Manchester, UK (Awarded 2008)
Discipline: Chemical Engineering
Dissertation Title: *Nucleation and Phase Relationships for Co-crystals*
Research Advisor: Roger Davey
- BSc (Hons)** University of Manchester Institute of Science and Technology, Manchester, UK (2004)
Subject: Chemistry

Professional Experience

- August 2012 - Present** **Assistant Professor**
Department of Industrial and Physical Pharmacy, Purdue University, West Lafayette, Indiana, USA
- Feb 2009 – July 2012** **Postdoctoral Associate**
Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA. (Supervisors: Bernhardt Trout and Allan Myerson)
- Nov 2007 – Jan 2009** **Postdoctoral Associate**
School of Chemical Engineering and Analytical Sciences, University of Manchester, Manchester, United Kingdom. (Supervisor: Roger Davey)

Research Interests and Expertise

- Nucleation and crystal growth
- Crystal Engineering – cocrystals, polymorphs and salts
- Heterogeneous nucleation and epitaxy
- Emulsion crystallization

- Solid state chemistry
- Downstream pharmaceutical manufacturing

Synergistic Activities

- Reviewer for the peer-review journals Crystal Growth & Design and CrystEngComm
- Scientific Advisor to the Editors of the Journal of Pharmaceutical Sciences
- Faculty Advisor to the Purdue Pharmaceutical Sciences club

Peer Reviewed Publications

18. *Polymorphism of Vanillin Revisited: The Discovery and Selective Crystallization of a Rare Crystal Structure*; Kavuru P., Grebinoski S. J., Wojtas L., Chadwick K.; manuscript being prepared for submission to CrystEngComm (2014).
17. *Crystallization Kinetics of Calcium Pyrophosphate*; Kavuru P., Stoldt J., Santiso E. E., Chadwick K.; manuscript being prepared for submission to Physical Chemistry Chemical Physics (2014).
16. *Self-Promoted Heterogeneous Nucleation: Crystallization Controlled by Cooperativity*; **Chadwick K.**, Wood G., Sheu I., Levina A., Myerson A. S., Trout B. L.; manuscript being prepared for submission to Crystal Growth and Design (2014).
15. *The Effect of Cross Linking on the Physical Properties of Acetaminophen loaded Calcium Alginate Microspheres*; Patel M., Schryer-Praga J., Dinh A., **Chadwick K.**; manuscript being prepared for submission to Journal of Pharmaceutical Sciences (2014).
14. *Advances in Heterogeneous Nucleation for Pharmaceutical Crystallization*; Patel M., **Chadwick K.**; manuscript being prepared for submission to Journal of Pharmaceutical Sciences (2014).
13. *Control of Nucleation and Crystal Growth on Polymeric Thin Films Using Surface Additives*; Ling J., Tweddale. I, **Chadwick K.**; manuscript submitted to Crystal Growth & Design (2014).
12. *Modification of Crystal Shape through Deep Temperature Cycling*; Jiang M., Zhu X., Molaro M., Rasche M., Zhang H., **Chadwick K.**, Raimondo D., Kim K., Zhou L., Zhu Z., Wong M., O'Grady D., Hebrault D., Tedesco J., Braatz R.; Industrial and Engineering Chemistry Research; 2014; 53; 5325-5336.
11. *Templated Nucleation of Acetaminophen on Spherical Excipient Agglomerates*; Quon J. L., **Chadwick K.**, Sheu I., Brettmann B. K., Myerson A. S., Trout B. L.; Langmuir; 2013; 29; 3292–3300.

10. *Separation of Impurities from Active Pharmaceutical Ingredients by Selective Co-Crystal Formation*; Hsi K., **Chadwick K.**, Fried A., Kenny M., Myerson A. S.; CrystEngComm; 2012; 14; 2386-2388.
9. *Towards the Rational Design of Crystalline Surfaces for Heteroepitaxy: The Role of Molecular Functionality*; **Chadwick K.**, Chen J., Myerson A. S., Trout B. L.; Crystal Growth & Design; 2012; 12; 1159-1166.
8. *Polymorphic Control by Heterogeneous Nucleation – A New Method for Selecting Crystalline Substrates*; **Chadwick K.**, Myerson A. S., Trout B. L.; CrystEngComm; 2011;13; 6625-6627.
7. *Solubility, metastable zone width measurement and crystal growth of the 1:1 benzoic acid/isonicotinamide cocrystal in solutions of variable stoichiometry*; Boyd, S.; Back, K.; **Chadwick, K.**; Davey, R. J.; Seaton, C. C.; Journal of Pharmaceutical Sciences; 2010; 99; 3779-3786.
6. *Designing Acid/Acid Co-Crystals through the Application of Hammett Substituent Constants*; Seaton, C. C.; **Chadwick, K.**; Sadiq, G.; Guo, K.; Davey, R. J.; Crystal Growth & Design; 2010; 10; 726-733.
5. *Designing Acid Acid Co-Crystals - The Use of Hammett Substitution Constants*; **Chadwick, K.**; Sadiq, G.; Davey, R. J.; Seaton, C. C.; Pritchard, R. G.; Parkin, A.; Crystal Growth & Design; 2009; 9; 1278-1279.
4. *Crystallization from Water-in-Oil Emulsions As a Route to Spherical Particulates: Glycine and the Hydrochloride Salts of Glutamic Acid and Ephedrine*; **Chadwick, K.**; Davey, R. J.; Mughal, R.; Marziano, I.; From Organic Process Research & Development; 2009; 13; 1284-1290
3. *The utility of a ternary phase diagram in the discovery of new co-crystal forms*; **Chadwick, K.**; Davey, R.; Sadiq, G.; Cross, W.; Pritchard, R.; CrystEngComm; 2009; 11; 412-414.
2. *Cocrystallization: A Solution Chemistry Perspective and the Case of Benzophenone and Diphenylamine*; **Chadwick, K.**; Davey, R. J.; Dent, G.; Pritchard, R. G.; Hunter, C. A.; Musumeci, D.; Crystal Growth & Design; 2009; 9; 1990-1999.
1. *How does grinding produce co-crystals? Insights from the case of benzophenone and diphenylamine*; **Chadwick, K.**; Davey, R.; Cross, W.; CrystEngComm; 2007; 9; 732-734.

Book Chapters

- **K. Chadwick**, J. Chen, E. Santiso, B. L. Trout; *Molecular Modeling Applications in Crystallization*; Cambridge University Press; Scheduled publication date – 2014/2015

Invited Talks

- **K. Chadwick**; The Role of Surfaces in Manufacturing Drug/Polymer Composite Materials; oral presentation at Hebei University of Technology, China (2014)
- **K. Chadwick**; The Role of Surfaces in Manufacturing Drug/Polymer Composite Materials; oral presentation at Tianjin University, China (2014)

- **K. Chadwick**; Designing Heterogeneous Surfaces for Controlling Crystal Nucleation; oral presentation at North Carolina State University; Raleigh, North Carolina, USA (2013).
- **K. Chadwick**; *Heteroepitaxial Control of Crystal Nucleation Using Crystalline Substrates*; oral presentation at SSCI (Aptuit); West Lafayette, Indiana, USA (2012).
- **K. Chadwick**; *The Role of Co-crystals in the Manufacture of Novel Pharmaceutical Formulations*; oral presentation at AstraZeneca, Delaware, USA (2008).
- **K. Chadwick**, R. J. Davey; *Nucleation and Phase Relationships for a Co-crystal*; oral presentation at AstraZeneca; Macclesfield, UK (2007).
- **K. Chadwick**; *Towards Developing a Mechanistic Understanding of Co-crystallization*; oral presentation at the Department of Chemistry, University of Cambridge, UK (2007).
- **K. Chadwick**, R. Davey; *Application of Molecular Spectroscopy for Studying the Nucleation of a Co-crystal*; oral presentation at Abbott Pharmaceuticals, Chicago, US (2007).

Conference Presentations

- J. Ling, **K. Chadwick**; Crystallization in Biocompatible Porous Spheres for the Manufacture of a Novel High Drug Loading, Rapid Release Formulation; oral presentation at the British Association for Crystal Growth annual meeting (2014).
- **K. Chadwick**; Towards a Mechanistic Understanding of Heterogeneous Nucleation: A Surface Chemistry Perspective; oral presentation at CECAM Workshop, EPFL, Lausanne, Switzerland (2014).
- **K. Chadwick**; Crystallization in Biocompatible Porous Spheres for the Manufacture of a Novel High Drug Loading, Rapid Release Formulation; oral presentation at the David E. Grant Symposium, University of Minnesota (2014).
- J. Ling, **K. Chadwick**; Engineering Co-crystals: Solving a Three-Dimensional Problem; oral presentation at the annual meeting of the American Institute of Chemical Engineers (2013).
- **K. Chadwick**, J. Chen, A. S. Myerson, B. L. Trout; *Heteroepitaxial Control of Crystal Nucleation Using Crystalline Substrates*; oral presentation at the annual meeting of the American Institute of Chemical Engineers (2012).
- **G. P. F. Wood**, **K. Chadwick**, E. E. Santiso, B. L. Trout; *Development and Application of a Heuristic to Study Heterogeneous Nucleation Mechanisms*; Annual Meeting of the American Institute of Chemical Engineers (October 2012).
- **K. Chadwick**, J. Chen, A. S. Myerson, B. L. Trout; *Heterogeneous Nucleation on Single Crystal Substrates: Understanding the Influence of Substrate Functionality*; oral presentation at the 18th American Conference on Crystal Growth and Epitaxy (2011).
- **K. Chadwick**, R. Mogul, I. Marziano, R. J. Davey; *An Emulsion Based Method for the Crystallization of Spherical Agglomerates*; oral presentation at the British Association for Crystal Growth Annual Conference 2008.

- **K. Chadwick**, D. Musumeci, C. A. Hunter, R. J. Davey; *Nucleation and Phase Relationships for a Co-crystal*; oral presentation the British Crystallographic Association Spring Meeting (2007).
- **K. Chadwick**, R. J. Davey; *Nucleation and Phase Relationships for a Co-crystal*; oral presentation at the 7th Crystal Growth of Organic Materials conference (2006)

Conference Posters

- **M. Jiang**, X. Zhu, M. Molaro, M. L. Rasche, D. M. Raimondo, K. Kim, H. Zhang, **K. Chadwick**, L. Zhou, Z. Zhu, M. Wong, D. O'Grady, D. Hebrault, J. Tedesco, R. D. Braatz; *A Multidimensional Population Balance Model for Growth and Dissolution Identified From a Designed Temperature-Cycling Experiment*; Annual Meeting of the American Institute of Chemical Engineers (October 2012).
- **K. Chadwick**, J. Chen, R. Ma, A. S. Myerson, B. L. Trout; *Controlling the Crystal Structure of Active Pharmaceutical Ingredients Using Heterogeneous Surfaces*; Peck Symposium (October 2012).
- **K. Chadwick**, J. Chen, R. Ma, A. S. Myerson, B. L. Trout; *Controlling the Crystal Structure of Active Pharmaceutical Ingredients Using Heterogeneous Surfaces*; Gordon Research Conference on Crystal Engineering (June 2012).
- **K. Chadwick**, R. Davey; *Application of Molecular Spectroscopy for Studying the Nucleation of a Co-crystal*; poster presentation at the British Association for Crystal Growth Annual Conference (2007).
- **K. Chadwick**, R. J. Davey; *Nucleation and Phase Relationships for a Co-crystal*; oral presentation at the 7th Crystal Growth of Organic Materials conference (2006).