Hongbo Chen

Contact Information

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Summary of Expertise

- 5+ years of experience in physical pharmacy
- Expertise in material science of pharmaceutical solids, including solid-state stability, pH-dependent solubility, and physicochemical characterization
- Rational design of formulations based on micromeritic and mechanical properties of drug, excipients, and their interactions in a powder mixture properties

Education

University of Minnesota, Minneapolis, MN — Sep 2015 - Present

Ph.D. Candidate in Pharmaceutics

- Advisor: Professor Changquan Calvin Sun
- Thesis: *Improve the manufacturability and dissolution performance of drugs through spherical crystallization*

Fudan University, Shanghai, China — Sep 2011 - Jun 2015

B.S., Pharmaceutical Science

Honors and Awards

David J.W. Grant & Marilyn J. Grant Fellowship in Physical Pharmacy	2019 - 2020
OLSTEINS Graduate Fellowship	2019
AAPS Travel Grant Award (supported by AstraZeneca)	2019
AAPS Best Abstract Award	2019
AAPS Best Abstract Award	2018
CURE Research Program Grant, Fudan University	2014
Undergraduate Research Opportunities Program Grant, Fudan University	2013
National Encouragement Scholarship, China	2012
Outstanding Student Scholarship, Fudan University	2012

Publications

1. **Hongbo Chen**, Aktham Aburub and Changquan Calvin Sun, 2019. Direct compression tablet containing 99% active ingredient - a tale of spherical crystallization. *Journal of Pharmaceutical Sciences.* **108** 1396-1400.
2. **Hongbo Chen**, Yiwang Guo, Chenguang Wang, Jiangnan Dun and Changquan Calvin Sun, 2019. Spherical cocrystallization - an enabling technology for the development of high dose direct compression tablets of poorly soluble drugs. *Crystal Growth & Design.* **19** 2503-2510.
3. **Hongbo Chen**, Chenguang Wang and Changquan Calvin Sun, 2019. Profoundly improved plasticity and tabletability of griseofulvin by in-situ solvation and desolvation during spherical crystallization. *Crystal Growth & Design.* **19** 2350-2357.
4. **Hongbo Chen**, Chenguang Wang, Hyunho Kang, Bo Zhi, Christy Haynes, Aktham Aburub and Changquan Calvin Sun, 2020. Microstructures and pharmaceutical properties of ferulic acid agglomerates prepared by different spherical crystallization methods. *International Journal of Pharmaceutics.* **574** 118914.
5. **Hongbo Chen**, Shubhajit Paul, Hongyun Xu, Kunlin Wang, Mahesh K. Mahanthappa and Changquan Calvin Sun, 2020. Polymer coating enabled quasi-emulsion solvent diffusion technique to reduce punch sticking propensity of celecoxib. *Molecular Pharmaceutics.* **17** 1387-1396.
6. **Hongbo Chen**, Hongyun Xu, Chenguang Wang, Hyunho Kang, Christy L. Haynes, Mahesh K. Mahanthappa and Changquan Calvin Sun. Cocrystal quasi-emulsion solvent

diffusion to simultaneously improve manufacturability and dissolution of indomethacin. **Manuscript in preparation**.

7. **Hongbo Chen** and Changquan Calvin Sun. Successful mini-tablet development of piroxicam enabled by spherical cocrystallization. **Manuscript in preparation**.
8. **Hongbo Chen**, Wei Li and Changquan Calvin Sun. Cocrystallization for reducing punch-sticking propensity and improving solid state stability and solubility - the case of fleroxacin. **Manuscript in preparation**.
9. **Hongbo Chen**, Manish Kumar Mishra and Changquan Calvin Sun. Brittle to elastic modulation in mechanical flexibility of single-component pharmaceutical crystal. **Manuscript in preparation**.
10. **Hongbo Chen** and Changquan Calvin Sun. Unconventional flow function of spherical agglomerates using a ring shear cell. **Manuscript in preparation**.
11. Jay Prakash Yadav, Ram Naresh Yadav, Praveer Sihota, **Hongbo Chen**, Chenguang Wang, Changquan Calvin Sun, Navin Kumar, Arvind Bansal and Sanyog Jain, 2019. Single crystal plasticity defies bulk-phase mechanics in Isoniazid cocrystals with analogous coformers. *Crystal Growth & Design.* **19** 4465-4475.
12. Jay Prakash Yadav, Ram NareshYadav, Piyush Uniyal, **Hongbo Chen**, Changquan Sun, Navin Kumar, Arvind Bansal and Sanyog Jain, 2019. Molecular interpr-etation of mechanical behavior in four basic structural features of Isoniazid with homologous cocrystal formers. *Crystal Growth & Design.* **20** 832-844.
13. Wei-jhe Sun, **Hongbo Chen**, Aktham Aburub and Changquan Calvin Sun, 2018. A platform direct compression formulation for low dose sustained-release tablets enabled by a dual particle engineering. *Powder Technology.* **342** 856-863.
14. Wenxin Yao, Peicheng Xu, Zhiqing Pang, Jingjing Zhao, Zhilan Chai, Xiaoxia Li, Huan Li, Menglin Jiang, **Hongbo Chen**, Bo Zhang and Nengneng Cheng, 2014. Local delivery of minocycline-loaded PEG-PLA nanoparticles for the enhanced treatment of periodontitis in dogs. *International Journal of Nanomedicine.* **9** 3963-3970.

Research Experience

Department of Pharmaceutics, University of Minnesota

Graduate Research Assistant Sep 2015 - Present

• *Reduction of Punch-Sticking Propensity of Celecoxib by Spherical Crystallization via Polymer Assisted Quasi-emulsion Solvent Diffusion*

- Developed a polymer-assisted quasi-emulsion solvent diffusion method to prepare celecoxib spherical crystals with significantly reduced punch sticking propensity.
- Proved polymer (HPMC) coating onto spherical crystals during the QESD process by techniques such as SEM and XPS.
- Investigated the mechanism of polymer coating from the molecular level by solution NMR and computational tool (Gaussian).

• *Cocrystallization for Improving Solid State Stability and Solubility and Reducing Sticking Propensity - the Case of Fleroxacin*

- Achieved to design and synthesize five new highly soluble and compressible fleroxacin salts and cocrystals exhibiting significantly lower tablet punch sticking propensity.
- Analyzed the solid state stability, solubility and punch sticking propensity of the drug and cocrystals.
- Investigated the structure-property relationship (e.g., tabletability, punch sticking propensity) by computational tools (e.g., Gaussian, CrystalExplorer).

• *Spherical Cocrystallization - An Enabling Technology for the Development of High Dose Direct Compression Tablets of Poorly Soluble Drugs*

- Established a novel method, spherical cocrystallization, to simultaneously improve manufacturability (e.g., flowability, tabletability) and dissolution of griseofulvin.

- Investigated the dissolution performance (pH-dependent) of high griseofulvin loading tablet formulations (55.7%) using an Artificial Stomach-Duodenum (ASD) apparatus with two chambers (pH 1.2 and 6.8).
- Controlled the cocrystal shape (spherical) and size (200-500 μm) to enable direct compression formulation development via spherical crystallization.
- Investigated the mechanism of enhanced dissolution after incorporating the hydrophilic polymer HPC in the granules.

• *Crystallization and Polymorphism of Norfloxacin*

- Obtained a new zwitterion anhydrate form of norfloxacin through solution mediated polymorph phase transition and determined the single crystal structure.
- Analyzed the correlation between the polymorphic outcome (form I, new form II and monohydrate) and the relative humility in the environment.
- Obtained forms I, II and monohydrate in bulk and characterized by a variety of ananlytical methods, including thermal analysis, intrinsic dissolution rate measurement, and solubility measurement.
- Investigated the correlation between structure (e.g., molecule structure, packing and interactions) and property (e.g., plasticity, elasticity) via computational tools.

• *Profoundly Improved Plasticity and Tabletability of Griseofulvin by in Situ Solvation and Desolvation during Spherical Crystallization*

- Implemented spherical crystallization technique to modify griseofulvin crystal shape and size, aiming to improve powder flowaility and tabletability.
- Found an in situ solvation and desolvation process to improve the plasticity and tableting performance using griseofulvin as a model drug.
- Analyzed the structure-property relationship by computational tools.

Collaboration with Eli Lilly and Company

Graduate Research Assistant Jan 2018 - Jul 2018

- Goal: Develop tablet formulations of high dose drugs for direct compression.
- Responsibilities: Design experimental plans, conduct experiments and present results monthly.
- Key achievements: Developed a direct compression tablet containing 99% active ingredient, investigated microstructures and pharmaceutical properties of agglomerates prepared by different spherical crystallization methods and submitted two manuscripts.

Professional Service

Reviewer

- AAPS PharmSciTech; Chemical Engineering Research and Design; European Journal of Pharmaceutical Sciences; International Journal of Chemical Kinetics; Powder Technology