

## Manufacturing Uniform and Tunable Crystals/Particles Using Slug Flow



Prof. Mo Jiang

*Medicines for All Institute*

Department of Chemical & Life Science Engineering

*Virginia Commonwealth University*

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### **Abstract:**

Crystals and particles play essential roles in many products that improve and/or save lives, including food ingredients, pharmaceutical tablets/capsules, and Lithium-ion batteries used in electronic vehicles and devices. The product quality, consistency, and manufacturing efficiency of these products depend on not only the chemical compositions, but also the sizes, uniformity, and reproducibility of these crystals/particles. These particle quality is challenging to achieve with current batch processes, especially across different scales. Correction processes are typically needed after crystal/particle generation, such as high-energy milling.

This talk focuses on designing scalable direct synthesis process and equipment of material crystals with tunable sizes without correction steps, inspired by the slug flow phenomena of gas-water mixture in tubing. Each crystal/particle experiences the same reaction or crystallization environment throughout the nucleation-growth process, leading to uniform crystals/particles of tunable properties. For enhanced quality control, certain common phenomena is suppressed, including secondary nucleation, attrition, and clogging/fouling. The equipment and condition can remain the same while tuning productivity. Experimental validation confirms that the modular designs potentially applies to multiple categories of (bio)chemicals and reactions involving solids.

### **Speaker Bio:**

Mo Jiang is an assistant professor in the Department of Chemical and Life Science Engineering at Virginia Commonwealth University. Mo's main research interests include to advance scalable sustainable production of emerging materials with precise control for health and energy applications, and to understand the links among the synthesis process, particle property distribution, and product quality. The Jiang Group research is currently funded by NSF, the Department of Energy, U.S. Pharmacopeia, and pharmaceutical companies. Before joining VCU in 2018, Mo received a Ph.D. in chemical engineering in 2015 at the Massachusetts Institute of Technology (MIT) then became a postdoctoral associate there. He received a B.S. in biology in 2006 from Tsinghua University and an M.S. in chemical engineering in 2008 from the University of Illinois at Urbana-Champaign.