

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Engineer concentration gradient drug particles using microfluidic systems** JIANBIN WANG, PAVITHRA SUNDARARAJAN, ADAM PROCOPIO, LARRY ROSEN, JERRY KLINZING, PATRICK MARSAC, Merck, MERCK RESEARCH LABORATORIES TEAM — Particles designed with spatial composition gradients have attracted increasing attention in the pharmaceutical industry. The designed distributions of drug, polymer or surfactants in the concentration gradient drug particles could enable control of the drug release kinetics or targeted delivery of the drug to provide therapeutic benefits. Here, we present a technique for generating concentration gradient particles from concentration gradient droplets using a microfluidic device. The concentration gradients in the liquid stream and the droplets were monitored with fluorescence microscopy and the concentration gradients were largely maintained. X-ray computed tomography was used to characterize the internal structure and concentration gradient profile in the solid particles. We successfully generated the concentration gradient particles in the coupled evaporative diffusive system by keeping the non-dimensional relative time scale for evaporation to diffusion to be 0.1 or less. Our experiments were instrumental to gaining fundamental insights into the processes controlling the concentration gradients in the particle and the droplet.

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Date submitted: 10 Nov 2014

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