Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

**Flash nano-precipitation of polymer blends: a role for fluid flow?**[1]
LORENA GRUNDY, Princeton University, LACHLAN MASON, Imperial College London, JALEL CHERGUI, DAMIR JURIC, LIMSI, CNRS, RICHARD V. CRASTER, Imperial College London, VICTORIA LEE, ROBERT PRUDHOMME, RODNEY PRIESTLEY, Princeton University, OMAR K. MATAR, Imperial College London — Porous structures can be formed by the controlled precipitation of polymer blends; ranging from porous matrices, with applications in membrane filtration, to porous nano-particles, with applications in catalysis, targeted drug delivery and emulsion stabilisation. Under a diffusive exchange of solvent for non-solvent, prevailing conditions favour the decomposition of polymer blends into multiple phases. Interestingly, dynamic structures can be 'trapped' via vitrification prior to thermodynamic equilibrium. A promising mechanism for large-scale polymer processing is flash nano-precipitation (FNP). FNP particle formation has recently been modelled using spinodal decomposition theory, however the influence of fluid flow on structure formation is yet to be clarified. In this study, we couple a Navier-Stokes equation to a Cahn-Hilliard model of spinodal decomposition. The framework is implemented using Code BLUE, a massively scalable fluid dynamics solver, and applied to flows within confined impinging jet mixers. The present method is valid for a wide range of mixing timescales spanning FNP and conventional immersion precipitation processes. Results aid in the fabrication of nano-scale polymer particles with tuneable internal porosities.

[1]EPSRC, UK, MEMPHIS program grant (EP/K003976/1), RAEng Research Chair (OKM), PETRONAS

Omar Matar
Imperial College London

Date submitted: 14 Sep 2017 Electronic form version 1.4