Abstract Submitted for the OSF16 Meeting of The American Physical Society

Thinking Green with Molecular Silver Nanoparticle Production BADRI BHATTARAI, University of Toledo, INDRANATH CHAKRABORTY, Indian Institute of Technology Madras, BRIAN CONN, AYDAR ATNAGULOV, University of Toledo, THALAPPIL PRADEEP, Indian Institute of Technology Madras, TERRY BIGIONI, University of Toledo, INDIAN INSTITUTE OF TECHNOL-OGY MADRAS COLLABORATION — Solution-phase (NP) syntheses involve large amounts of solvent and produce small quantities of product. Although dry methods of making NPs exist (e.g. ball milling), for ligand-passivated colloidal NPs the costs (financial, environmental, health, etc.) associated with solvent use seem to be inevitable. A partially solid-state synthesis was recently proposed wherein the amount of solvent was significantly reduced, however it was not well developed and lacked generality. We have studied this process to understand the limits of the solidstate approach and to leverage the best features of both solid-state and liquid-state approaches. Most importantly, we used a silver-thiolate paste as a precursor, instead of a metal salt solution, to achieve intimate mixing of solid-state reagents, eliminate solvent waste, and retain the high mobility needed for a high yield reaction. The synthesis yielded solid NPs, in paste form, which may be processed using a nominal quantity of solvent. This produced only $Na_4Ag_{44}(p-MBA)_{30}$ NPs with an 89% yield and reduced solvent use by ~90%.

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Date submitted: 12 Sep 2016

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