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Nucleation and Growth of ZnO in Organic Solvents - an in Situ Study

C. Lizandara-Pueyo,[†] M. W. E. van den Berg,[‡] A. De Toni,[‡] T. Goes,[†] and S. Polarz*,[†]

Department of Chemistry, University of Konstanz, 78457 Konstanz, Germany, and Ruhr-University Bochum, Universitaestrausse 150, 44780 Bochum, Germany

Received June 6, 2008; E-mail: sebastian.polarz@uni-konstanz.de

Abstract: ZnO is a metal oxide material which possesses versatile properties and applications. Therefore, the target-oriented preparation of ZnO has become a major issue. Many preparation techniques involve bottom-up methods from precursor solutions. In the current contribution, a special precursor system is described that enables a fine-control of kinetic parameters for the nucleation and growth of ZnO in various organic solvents. A large variety of analytical techniques could be applied in an in situ fashion to probe for the ZnO formation at all times and all length scales. Among the analytical techniques are UV/vis, Raman, Fluorescence, X-ray absorption, ^{1}H NMR-spectroscopy, dynamic light-scattering, and TEM. Three different regimes for nucleation and growth with different characteristics could be identified. Furthermore, the effect of different parameters on the resulting ZnO particle size was investigated.