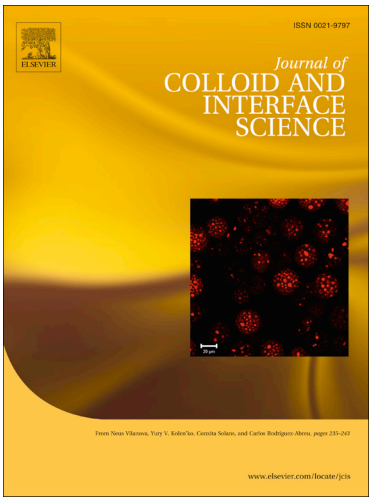

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J.S. Gebauer, V. Mackert, S. Ognjanović, M. Winterer

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Tailoring metal oxide nanoparticle dispersions for inkjet printing

J. S. Gebauer[1] V. Mackert[1], S. Ognjanović [1] and M. Winterer[1,]

[1] Nanoparticle Process Technology and CENIDE, University of Duisburg-Essen, 47057 Duisburg, Germany.

* E-Mail: julia.gebauer@uni-due.de

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Abstract

There is a growing interest in science and industry for printed electronics. Printed electronics enable the production of large quantities of electronic components at low cost. Even though organic semiconductors are already widely used for printed components, inorganic materials may be advantageous due to their higher durability and superior device performance. Nevertheless, inorganic materials still remain difficult to print making the development of printable and functional inks a necessity. In this work we present the formulation, inkjet printing and processing of newly developed inks based on ethylene glycol as dispersion medium. Different metal oxide nanoparticles (ZnO, TiO_2, CuO, SnO_2 and In_2O_3) with high crystallinity and narrow size distribution were produced by chemical vapor synthesis. The particles were stabilized and the colloidal stability was evaluated by a combination of DLVO simulations and dynamic light scattering measurements. Measurements of rheological and interfacial properties, like viscosity and surface tension, are used to determine the printability on the basis of the inverse Ohnesorge number. Inks, developed in this work, have adjustable rheological properties as well as long-term stabilities without particle sedimentation over a period of several months. They are suitable for printing on different substrate materials like silicon and flexible polymeric substrates.