

The influence of the dispersants on printing ink properties of metal oxides nanoparticles

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Colloidal stability of inkjet printing inks is one of the key parameters for their good printing performance. The stability of particles dispersed in water-based inks is usually achieved by electrostatic, steric, or electrosteric stabilization. Adsorption of polyelectrolytes of increased molecular weight at the solid interface of dispersed particles is responsible for electrosteric stabilization. In this work, stable homogeneous suspensions of MOx (TiO₂ and ZnO) were prepared using gum arabic (GA) and solspers 40000 as dispersants. GA is a natural polyanionic polysaccharide with carboxylic groups as anchors, while Solspers 40000 is an anionic phosphated alkoxyated polymer of Lubrizol. Both dispersants provide electrosteric stabilization of pigments in water based inks. GA was employed as dispersant to study the effect on the surface properties of MOx nanoparticles. GA has been used as the stabilizing agent for ink pigments for a long time. It is well known that GA can make the MOx nanoparticles have a good dispersibility and stability in GA colloidal solution for its low viscosity. The investigations on the optimum concentration of dispersants and the mechanism determining the dispersion behavior of MOx in aqueous dispersants solution were performed. Suspensions of MOx and GA/Solspers were prepared first by dissolving dispersants in water. MOx were added in appropriate amounts. The weight ratio between MOx and GA (solspers) was varied from 1/1 to 3.5/1. The ball milling was performed in a Retch PM 100 planetary ball mill at constant milling speed of 250 rpm using YSZ jar and balls. The effects of different milling time (15, 30, 60, 90 and 180 min) on average particle sizes were investigated. Results show improved dispersion with reduction of average particle sizes with increasing of milling time. Different ink formulations composed of MOx/dispersants (with addition of 1, 2 propylene glycol and n-propanol) were prepared and their printability properties were tested using Inkjet printer Fuji Dimatix DMP-3000. The main goal of this work is to analyse the influences of different quantity of dispersants and milling conditions on the printing quality parameters of the ink using different substrates.