Oxide nanoparticles for printed electrical and electrochemical devices on paper

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The growing demand of new and sustainable consumer printed electronics led to the increased interest in electric and electrochemical devices on paper substrates. Here we present the wok resulting from recent research concerning the combination of oxide nanoparticles with cellulosic materials. First topic is related to nanostructured electrochromic printed films with controllable dual phase, which show an optical density 80% higher than amorphous ones, in parallel with improved coloration efficiency and response time (below 3s). Second topic to be addressed are printable inks based on commercial ZnO NPs mixed with some cellulose derivatives that were optimized to create printed channel layers at temperatures lower than 150 °C. This allowed the development of fully screen-printed EGTs with mobility above 1 cm2V-1s-1 and on/off current ratio close to 10^4. Finally, the dual phase approach was used to prepare inks that can be written on paper, resulting in dense NPs matrix with sufficient interparticle connectivity to be used in hybrid handdrawn/printed UV-sensors, transistors and logic gates