New Ideas. New Materials.

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One-step printing process provides cost-efficient transparent, conductive and patterned coatings for flexible touchscreens

Mobile phones and smart phones still haven‘t been adapted to the carrying habits of their users. That much is clear to anyone who has tried sitting down with a mobile phone in their back pocket: the displays of the innumerable phones and pods are rigid and do not yield to the anatomical forms adopted by the people carrying them. By now it is no longer any secret that the big players in the industry are working on flexible displays. How to produce cost efficient suitable coatings for that will be demonstrated by the developments of the INM – Leibniz Institute for New Materials at the International Nanotechnology Exhibition and Conference *nano tech 2016*, Tokyo, Japan.

From January 27 to 29, the researchers of the INM will be presenting their results at the German Area, Booth 5J-17.

The INM will be presenting new nanoparticle inks, using transparent, conductive oxides (TCO`s). They are suitable for a one-step printing process on thin plastic foils. Thus transparent lines and patterns were obtained by direct gravure printing, which are electrically conductive even after bending. Conductive coatings with TCOs are usually applied by means of high vacuum techniques, as sputtering. For patterning of the TCO coatings additional process steps as photolithographic and etching process steps are necessary. They are cost-intensive, in contrast to a one-step printing process, which is enabled by using the new developed TCO inks.

“We use the TCOs to produce nanoparticles with special properties”, says Peter William de Oliveira, Head of the *Optical Materials* Program Division, “the TCO ink is then created by adding a solvent and a special binder to these TCO particles.” The binder performs several tasks here: it not only makes the TCO nanoparticles adhere well on the film; it also increases the flexibility of the TCO coating. In this way, the conductivity is maintained even when the films are bent. The ink can then be applied to the film directly by gravure printing using a printing plate. After curing under UV light at low temperatures less than 130°C, the coating is ready.

The transparent electronic inks allow conductor tracks to be produced unproblematically even on a large-scale by means of the classic reel-to-reel process. Initial trials at INM have been promising. The researchers all agree that the use of structured rollers will in the future allow even large, structured conductive surfaces to be printed with a high throughput at low cost.

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INM conducts research and development to create new materials – for today, tomorrow and beyond. Chemists, physicists, biologists, materials scientists and engineers team up to focus on these essential questions: Which material properties are new, how can they be investigated and how can they be tailored for industrial applications in the future? Four research thrusts determine the current developments at INM: *New materials for energy application*, *new concepts for medical surfaces, new surface materials for tribological applications* and na*no safety and nano bio*. Research at INM is performed in three fields: *Nanocomposite Technology*, *Interface Materials*, and *Bio Interfaces*.

INM – Leibniz Institute for New Materials, situated in Saarbrücken, is an internationally leading centre for materials research. It is an institute of the Leibniz Association and has about 220 employees.