

Large volume continuous synthesis of metal oxide nanoparticle inks for Printed Electronics

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Abstract:

In contrast to lab-scale approaches, industrial manufacturing requires large-volume, inexpensive, and well-controllable processes. Promethean Particles has the ability to produce metal and metal oxide nanoparticle-based dispersions which offer a wide range of functionalities and electrical properties tuneable by composition.

As an example, an ink for solution-processed semiconducting thin films has been developed based on a continuous solvothermal synthesis process. IZO nanoparticles inks showing intrinsic stabilisation in a mixed polyol/alcohol solvent have been produced and modified for spin and inkjet processing. Thin-film transistors (TFTs) were fabricated by spin coating and inkjet printing on to a p+- Si/SiO₂ substrate. Annealing of the semiconducting layer in air yields TFT devices with a saturation mobility of 0.6 cm²/Vs. This approach yields performance values close to amorphous silicon and has a high potential for further improvements.

In addition Promethean has also developed a route to the continuous production of metallic nanoparticle dispersions and inks for use as conductive inks. In particular copper nanoparticles have been produced which provide a true alternative to the use of silver for conductive tracks in the printed electronics industry.

The controlled and continuous production of these nanoparticles delivers a versatile and facile basis for industrial-scale solution processing of inorganic conductors, semiconductors and dielectrics.