

Xenon flash lamps for the highly efficient sintering of copper ink

Copper inks are a cost-effective alternative to silver inks when it comes to printed electronics for RFID or smart packaging. However, the sintering of copper ink on paper poses a genuine challenge. A co-operation between three companies: Promethean Particles, Dycotec Materials and Heraeus Noblelight, showed how copper nanoparticles in printed ink are easily and quickly fused by xenon flash lamps and thus form highly conductive and stable electronic circuits. Unlike silver, copper rapidly forms oxides in the air, which makes sintering more difficult or even impossible. So far, copper ink is often sintered in an oven under inert gas, which requires specialized environment not suited for every process line and is relatively slow. Xenon flash systems on the other hand, transfer a great deal of energy into the ink within milliseconds. This causes the ink to sinter so rapidly that no oxidation process takes place. In addition, the substrate, e.g. foil or paper, is hardly heated with this rapid energy transfer and is thus not damaged. Promethean Particles from Nottingham, UK, manufactures nanomaterials, Dycotec Materials is based in Swindon and produces inks and coatings, and Heraeus Noblelight has developed a Xenon flash lamp system for the sintering of metallic inks in Cambridge.

“From discussions with our customer base, there is a clear need for digital additive processing with low cost ink systems. Our new high volume manufacturing facility has enabled us to demonstrate our capability to produce high quality nanoparticles at quantities in excess of 1,000 tonnes per annum”, commented Laurie Geldenhuys, CEO of Promethean Particles. Dr. Richard Dixon, Managing Director of Dycotec Materials added, “using the Promethean Particles’ nanomaterials we were able to produce high solids loading inks with demonstrable stability that can be processed using inkjet heads operating at high frequencies, ensuring compatibility with high volume production. Processing our inks with the Heraeus flashlamp system enabled excellent electrical conductivity to be achieved of $\sim 3 \text{ m}\Omega/\square/\text{mil.}$ ”

Martin Brown, Applications Manager of Heraeus Noblelight commented that “photonic sintering of inks offers significant benefit over conventional oven processing that requires substantially larger footprints, higher operating costs and longer processing times. For copper inks, our Heraeus Xenon Flash technology is particularly well suited as the fast processing speeds overcome the copper oxidation issues.”

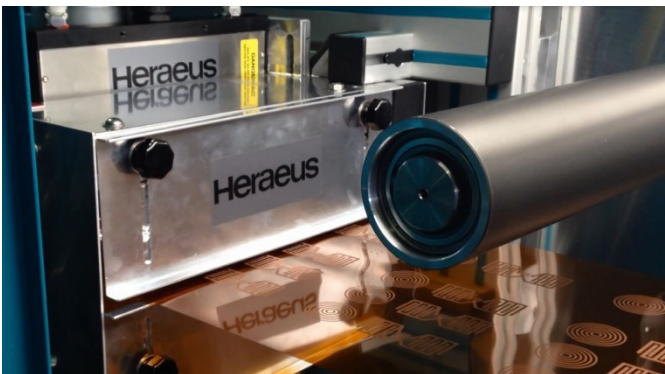


Photo courtesy of Coatema Coating Machinery GmbH

Features

- Sintering copper ink on paper
- Excellent electrical conductivity of $\sim 3 \text{ m}\Omega/\square/\text{mil.}$, with regard to cross-section and mass of the material

Technical Data

- Nano copper ink with high solids content
- Xenon flash system
- Sintering within milliseconds reduces copper oxidation issues
- Rapid energy transfer protects the substrate from damage

Germany
Heraeus Noblelight GmbH
 Optics and Flash
 Heraeusstraße 12-14
 63450 Hanau
 Phone +49 6181 35-8492
 Fax +49 6181 35 16-8410
 hng-contact@heraeus.com
 www.heraeus-noblelight.com/arcflash

USA
Heraeus Noblelight America LLC
 1520C Broadmoor Blvd.
 Buford, GA 30518
 Phone +1 678 835-5681
 Fax +1 678 835-5766
 info.hna.af@heraeus.com

Great Britain
Heraeus Noblelight Ltd.
 Cambridge Science Park
 Cambridge, CB4 0GQ
 Phone +44 1123 42-3324
 Fax +44 1223 42-3999
 hnl-laserlamps@heraeus.com

China
Heraeus Noblelight (Shenyang) LTD
 2F, 5th Building 5
 No. 406, Guilin Rd, Xuhui District
 200233 Shanghai
 Phone +8621 3357-5555
 Fax +8621 3357-5333
 info.hns@heraeus.com