



FORMULATION AND SCREEN PRINTING OF CONDUCTIVE SILVER INKS ONTO ZIRCONIA CERAMICS FOR STRAIN MONITORING

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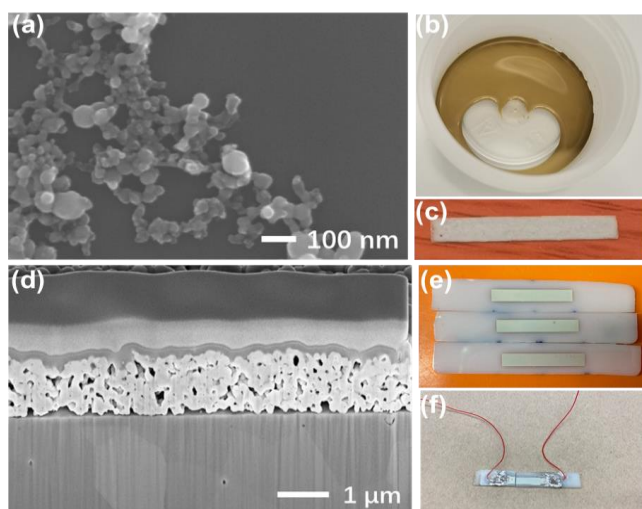
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Oral presentation

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ABSTRACT

Currently, silver nanoparticles have gained enormous attention due to their high electrical conductivity, low cost in contrast to gold, relative resistance to oxidation, and biocidal properties. They can be used to produce conductive inks, which allow manufacturing electronic devices by using various printing techniques. In this work, silver nanoparticles have been prepared through pulsed-wire evaporation in water and ethanol, respectively. By this method, electrical energy with a high voltage is applied through a thin metallic wire in a liquid solution, generating nanoparticles after evaporation and condensation. Synthesized silver nanoparticles were redispersed into glycerol in a 50 wt.% concentrated solution to achieve conductive ink where polyvinyl pyrrolidone acted as the capping agent. Silver ink was then screen-printed on a polyimide substrate and sintered at 120°C and screen-printed onto zirconia samples using a mesh screen mask. Results showed that nanoparticles average size slightly increased using water as a solvent. The surface roughness and morphology of sintered silver patterns were characterized by FIB where a homogenous thickness of $1.2 \pm 0.1 \mu\text{m}$ was measured for all studied samples. The sensing capabilities of printed conductive patterns were investigated under bending conditions by four-point bending tests. Results displayed a reproducible correlation between electrical response and applied strain. In this sense, resistance increased as increasing strain applied on zirconia samples.



a) Synthesized silver nanoparticles in ethanol, b) Ink preparation using synthesized nanoparticles, c) Screen-printed silver pattern on polyimide, d) FIB micrograph of silver pattern ink on zirconia substrate, e) Screen-printed silver patterns on zirconia samples, f) Sample after bending test.