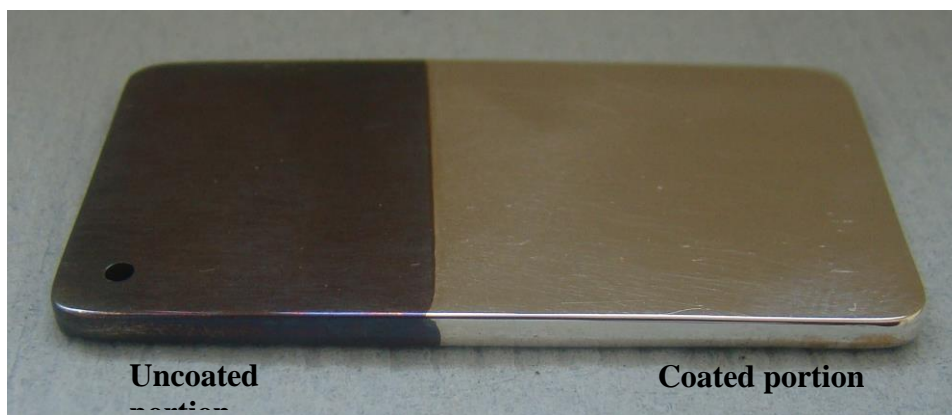


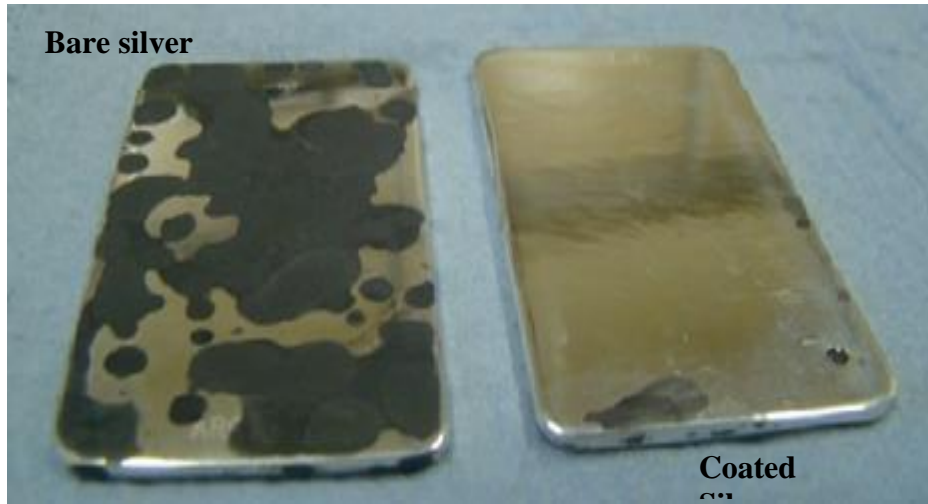
ARCI develops low cost, durable anti-tarnishing coatings

International Advanced Centre for Powder Metallurgy & New Materials (ARCI), an autonomous R&D Centre of Department of Science and Technology (DST), has developed organic-inorganic sol-gel derived titania-zirconia thin film on a metal substrate by dip coating followed by drying. The organic-inorganic hybrid coatings can last up to 7 years and has lower processing cost as compared to Atomic Layer Deposition (ALD) which is the only method available for inorganic anti-tarnishing coating. The uniformity of the coated materials was verified by testing surface defects and chemical homogeneity of the coated and uncoated substrate with the help of a scanning electron microscope (SEM) attached with energy dispersive spectroscopy (EDS) facility.

A transparent organic-inorganic anti-tarnishing coating having perspiration and sulfide resistance properties on coinage metals, mainly brass and silver, which are most widely used in the manufacture of the ornaments, has been investigated. Considering the shelf-life of the sol and the performance of the anti-tarnishing coating against the accelerated H₂S and perspiration resistance, this technology is certainly viable for commercialization. So far, more than 10 kg of complex-shaped silver articles have been coated successfully.

The coating thickness and Refractive Index (RI) measurement was carried out by variable angle spectroscopic ellipsometer. The aesthetic and physical appearance of the coated article were subjected to color space (L*A*B) analysis using UV-visible absorbance spectroscopy. Accelerated sulfide and perspiration resistance test was done using potassium polysulfide and a synthetic sweat solution. The coated metals coupons showed significant improvement compared to uncoated metallic coupons. No significant change in the reflectance spectrum of bare, coated, and tested silver coupon in the visible region confirms the retention of the aesthetic appearance of the substrate. Mechanical characteristics such as hardness and adhesion of the film were also rated to be in acceptable ranges. The anti-tarnishing coating materials showed stability over 12 months.





Perspiration resistance test on coated and uncoated silver substrates



Brass shield appearance coated and uncoated regions after 7 years