

## Synthesis of Nanosized Amorphous Alumina Particles and Their Use in Electroless Ni-P Coatings

**Authors :** Preeti Makkar, R. C. Agarwala, Vijaya Agarwala

**Abstract :** The present study focuses on the preparation of Al<sub>2</sub>O<sub>3</sub> nanoparticles by top down approach i.e. mechanical milling using high energy planetary ball mill at 250 rpm for 40h. The milled Al<sub>2</sub>O<sub>3</sub> nanoparticles are then used as the second phase to develop electroless (EL) Ni-P- Al<sub>2</sub>O<sub>3</sub> nanocomposite coatings on mild steel substrate. An alkaline bath was used with a suspension of Al<sub>2</sub>O<sub>3</sub> particles (4 g/L) for the synthesis of Ni-P-Al<sub>2</sub>O<sub>3</sub> nanocomposite coating. The surface morphology, size range and phase analysis of as-prepared Al<sub>2</sub>O<sub>3</sub> particles and the coatings were characterized using X-ray diffraction (XRD) and field emission scanning electron microscopy (FESEM). The coatings were heat treated at 400°C for 1h in argon atmosphere and the hardness of the nanocomposite coatings was investigated with respect to Ni-P before and after heat treatment. The results showed that as milled Al<sub>2</sub>O<sub>3</sub> nanoparticles exhibit irregular shaped and size ranges around 40-45 nm. The Al<sub>2</sub>O<sub>3</sub> particles are uniformly distributed in Ni-P matrix. The microhardness of the coatings is found to be significantly improved after heat treatment (1126 VHN).

**Keywords :** Electroless (EL), Ni-P-Al<sub>2</sub>O<sub>3</sub>, nanocomposite, mechanical milling, microhardness

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020