Abstract

Electroless coatings are based on a process known as autocatalytic deposition, wherein a reducing agent triggers a chemical reaction between metal ions and a metal surface, resulting in the formation of a continuous and uniform metal coating. Unlike traditional electroplating methods that rely on electrical current, electroless coatings utilize chemical reactions to deposit a uniform and adherent layer of material onto the substrate.

Electroless coatings offer numerous advantages over traditional electroplating methods, making them suitable for a wide range of applications. Some of the key advantages include: Uniformity, good adhesion, high corrosion resistance and high wear resistance versatility. The unique properties of electroless coatings make them highly sought after in numerous industrial applications. Some prominent applications include: electronics and electrical components, the automotive industry, aerospace and defence, chemical processing, etc.

The present thesis work involves the deposition of binary Ni-B, binary Ni-P and composite Ni-B and Ni-P coatings reinforced with nanoparticles, and investigation into their characteristics and their properties. Three different nanoparticles (viz. nano-Alumina, nano-Titania and nano-Zirconia) are incorporated into Ni-B coatings. Morphology, hardness and elastic modulus, friction and wear behaviour, scratch resistance and corrosion characteristics of these coatings are evaluated experimentally. Finally, an attempt is made to compare the properties of the coatings produced by incorporating nano-Alumina in Ni-B and Ni-P coatings. It is believed that the present results will serve both academic and industrial interests.