Tribological Properties of Ni-P Electroless Coatings on Low-Carbon Steel Substrates Using an Environmentally Friendly Pretreatment

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This study deposits Ni-P alloy films coatings onto low carbon steel substrates using an electroless process. The coating's morphology and properties, including the hardness, polarization and frictional behavior, are analyzed. A conventional pretreatment that uses roughening and activation steps ensures better adhesion between the Ni-P plated layer and the substrate and renders the substrates catalytic. This study reports an environmentally friendly pretreatment for the substrates: physical sandblasting (using emery powder particles) and oxygen plasma etching. XRD analysis shows that the diffraction pattern for the Ni-P alloy exhibits a wider peak, which indicates that there is an amorphous phase. SEM micrographs after electroless Ni-P plating that uses plasma etching show that the surface is more even and fairly smooth, which indicates good Ni-P film characteristics. The experimental results show that a plasma etching pretreatment for coating with Ni-P film increases the hardness and corrosion resistance and reduces the coefficient of friction.

Keywords: electroless plating, substrates pretreatment, Ni-P films, sandblasting, plasma etching.

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