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Effect of Pretreatment on Nickel-Boron Coatings Deposited on 8620H Alloy Steel Adhesion and Corrosion Resistance

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Opinion

The 8620H steel substrates were electrodeposited with Ni-B coatings after various pretreatments, including no pretreatment, after sandblasting with glass sand, and after sandblasting with emery powders. 8620H alloy steel is a Ni-Cr-Mo alloy steel with a high wear resistance that is achieved using a surface carburizing hardening process. High tensile strength and high percent elongation are among the mechanical features of 8620H alloy steel. As a result, 8620H steel is appropriate for engineering parts such as gears, bearings, power screws, automobile parts, and so on. Because of its good corrosion resistance, high hardness, and high wear resistance, Ni-B coatings have been developed as a protective layer on metal substrates. Electro-less plating and electroplating are the two most used procedures for preparing Ni-B coatings. Boron is obtained from Di Methyl Amine Borane (DMAB) or Tri Methyl Amine Borane (TMAB) in the plating solution for NiB coatings applied by electroless plating or electroplating. The former is an autocatalytic redox process in which electrochemical processes take place without the need for an external source of electric current, while the latter is a common coating method for metal or alloy thin films with benefits such as low cost and easy deposit rate control. However, Ni-B coatings produced by electroless plating have sluggish deposition rates (i.e., can only produce ultra-thin films), a short bath life, and it is difficult to control the deposition composition. The use of Ni-B coatings for wear resistance and corrosion resistance will be limited due to these flaws. Higher deposition rates, cheap cost, low porosity, excellent purity, and simplicity of alloy composition control are some of the advantages of the electrodeposition method. As a result, the electroplating method is better for applying Ni-B coatings in industry. In general, the corrosion resistance of coatings is determined by physical qualities such as substrate adherence, hardness, and roughness. Previous research have shown that in the electro-less process, it is required to employ substrates with a high roughness in order to prepare a coating with reduced porosity and greater corrosion resistance. The electroplating technique was utilised to manufacture Ni-B coatings, which were projected to have a thickness larger than that of Ni-B coatings prepared using the electro-less process. The influence of various substrate pretreatment processes on the adhesion and corrosion resistance of NiB coatings is investigated. The effects of different pretreatment processes, such as no pretreatment, glass sand sandblasting, and emery powder sandblasting, on the adhesion strength and corrosion resistance of Ni-B coatings placed on 8620H steel substrates were examined. The best adhesion strength of Ni-B coatings was found on 8620H steel substrates after sandblasting with emery powders. During scratch testing, the Ni-B coatings were not affected in the applied load range of 0 to 50 N. Ni-B coatings coated under diverse pretreatment conditions, such as without pretreatment, after sandblasting with glass sand, and after sandblasting with emery powders, had I values of 9.4610-6, 8.6210-6, and 2.3110-6 A/dm^2, respectively. The corrosion resistance of both Ni-B coatings placed on substrates without pretreatment and sandblasting with glass sand is dramatically reduced. Because the Ni-B coatings were not destroyed during the wear process, the value of Ni-B coatings placed on substrates by sandblasting with emery powders barely changed minimally.

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