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Corrosion resistance of electroless nickel-boron coating in a bath exempt from stabilizer

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Abstract: Electroless nickel-boron (ENB) coatings from borohydride-reduced bath have received wide acceptance thanks to their excellent hardness and superior wear resistance. Therefore, they have been considered as an alternative to hard chrome. However, the presence of a small amount of toxic heavy metals such as Pb or Tl in the plating bath restricts their application. These metallic salts are used to stabilize the bath, which is necessary to avoid abrupt decomposition, and are harmful towards the environment. A new bath, that is exempt from stabilizer, was designed for ENB plating. In this bath, the bath stability is achieved through the optimization of the concentration of complexing agent, pH adjuster, and reducing agent. An ENB coating from the new bath presents promising properties including modified surface morphology, excellent hardness, low friction coefficient, etc. Salt spray test (ASTM B117-07) and potentiodynamic polarization test results showed that the new ENB coating has a significantly better corrosion resistance than the conventional ENB coatings stabilized by Pb or Tl salts. In conclusion, the present ENB coating is produced in an environmentally friendly bath, and the deposit presents properties close to those of the conventional ENB deposit.

Keywords: Electroless-nickel-boron deposit; environmentally friendly technology; corrosion resistance