Corrosion behavior of heat treated electroless Ni-P/Ni-B duplex coatings

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The corrosion behavior of electroless nickel–boron and nickel-phosphorous duplex, monolayer and bilayer was investigated after heat treatment. Single coatings of electroless nickel bath with 20 µm of thickness were compared with duplex coatings composed of two 10 µm layers. Four distinct configurations of duplex coatings were prepared: NiB/NiP; NiP/NiB; NiB/NiB and NiP/NiP. Even though the heat treatment may have a negative impact on the corrosion properties, it is used in order to enhance the mechanical properties of electroless nickel coatings. In this work, the obtained coatings were all submitted to the same heat treatment (400°C-1h) under non-reactive atmosphere. Morphological analyses were carried out on the sample surfaces after salt spray test. The results allowed to conclude that pitting corrosion starts after 6 hours for all coating configurations studied. However, visible differences exist in terms of general corrosion: in the case of NiB coatings, it appears after one day; whereas in the case of NiP coatings, it appears after 7 days. The duplex coatings presented intermediate behaviors between those achieved by the monolayer systems. Also, corrosion behavior was evaluated by means of potentiodynamic polarization. Results clearly suggested that pure NiP exhibits higher corrosion resistances than deposited NiB.