PO4072

Active Screen Plasma Nitriding of austenitic stainless steel inner diameters

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Stainless steels, especially the austenitic grades, present a good corrosion resistance, but poor mechanical properties. Nitriding can increase the surface hardness, but typically at the expense of corrosion resistance. Besides, nitriding of complex geometries might be technically challenging, as variations in the plasma along the treated part can cause non-uniformity in the thickness of the nitrided layer and modifications in its microstructure, thus changing surface properties and leading to inadequate performance of the treated component. This work has focused on the development of active screen plasma nitriding of inner geometries of the widely used AISI 316L austenitic stainless steel, with preservation of the corrosion resistance properties. Nitrided surfaces have been metalographically characterized and analyzed with Optical Microscopy, Scanning Electron Microscopy and Energy Dispersive Spectroscopy. Additionally, corrosion resistance has been tested and evaluated. As a result of the study, a relation has been established between treatment parameters (treatment duration and temperatures, voltages, diameter of inner geometries, gas mixture, etc.) and phases present in the resulting nitride surfaces. Moreover their relation with the corrosion resistance has been established. This has led to defining an active screen plasma nitriding treatment of inner geometries with good corrosion resistance, in combination with a significant hardening of the surface, and the relation of these properties with the surface microstructure and the plasma processing conditions.

Keywords
active screen plasma nitriding
stainless steel
austenitic
inner geometry
corrosion