

ABSTRACT

CORROSION RESISTANCE OF PASSIVATED AUSTENITIC STEELS AISI 316L AND AISI 321

Stainless steels are often used in the automotive industry owing to their corrosion resistance properties and appearance. Stainless steel alloys contain iron and a mass fraction of chromium of at least 10.5%. The chromium oxide layer that forms on the surface of stainless steels provides basic protection against corrosion. The formation of the chromium oxide layer on the surface is a natural phenomenon that occurs under normal atmospheric conditions. However, the process can be accelerated using various chemical means, i.e. passivators. The process depends heavily on the surface treatment of stainless steel.

The research focused on determining the impact of the surface quality of austenitic stainless steels AISI 316L (EN 1.4404) and AISI 321 (EN 1.4541) on corrosion resistance under conditions simulating actual environment. Electrochemical methods (corrosion potential measurement, linear polarization and potentiodynamic curves) were used to determine the corrosion properties of steels, the condition of the surfaces and their passivation level. X-ray photoelectron spectroscopy (XPS) and atomic force microscopy (AFM) were used to ascertain the composition and thickness of the chrome oxide layer. The salt spray test helped determine the corrosion resistance of materials in salty conditions in a certain time frame, while confocal microscopy enabled a qualitative assessment of the effects of pitting corrosion after exposing the steels to a simulated corrosive environment.

Key words: stainless steel AISI 316L and AISI 321, electrochemical methods, X-ray photoelectron spectroscopy (XPS), atomic force microscopy (AFM), confocal microscopy.