

The corrosion resistance of supermartensitic steels compared to martensitic steels in different corrosion media

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Abstract : The supermartensitic stainless steels deduced from the refinement of the composition of martensitic steels, have a low carbon content with 13% of chromium, 5% of nickel and 2% of molybdenum, this new generation of steel has an improved ductility with a good resistance mechanical and excellent resistance to corrosion. In this work, a comparative study of the corrosion behavior of these two stainless steels in different aggressive chlorinated and sulphurized media was carried out. Stationary (polarization curves) and transient (electrochemical impedance) electrochemical methods have been applied. The rate of corrosion as a function of time was determined by the mass loss method and the characterization of the surface condition was studied by optical microscopy. Two types of corrosion were observed: uniform corrosion in which the half-reactions are homogeneously distributed in 0.5M H₂SO₄, followed by localized corrosion observed in 0.5M NaCl for both steels. According to the polarization curves, the corrosion potential differs between martensitic steel and supermartensitic steel where it has a higher potential with -0.342 V / Ag / AgCl in 0.5M H₂SO₄ and -0.339 V / Ag / AgCl in 0.5M NaCl. In parallel, the polarization resistance given by EIS shows that in both media, supermartensitic steel is more resistant than martensitic steel where it has an R_p equal to 7200 Ohm in 0.5M H₂SO₄ and 8340 Ohm 0.5M NaCl. These results are confirmed by the optical microscope microstructure.

Keywords : corrosion, martensitic stainless steel, supermartensitic stainless steel