Intergranular corrosion of austenitic stainless steels in oxidizing nitric media

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Intergranular corrosion (IC) of low carbon austenitic stainless steels in oxidizing nitric media is a long-known industrial issue. However, one stainless steel, named Uranus S1N, and containing 4 wt.% of Si, was shown to resist to intergranular corrosion but at the expense of a higher surface corrosion rate. Therefore, this work aims to better understand the higher resistance of Uranus S1N to IC in order to design an optimized stainless steel composition leading to improved surface and localized corrosion properties.

The corrosion behavior of industrial stainless steels with different chemical compositions and susceptible to IC corrosion in oxidizing nitric media (304L, 316L, Uranus 65) was investigated and compared to that of Uranus S1N. The results obtained showed that the resistance to IC corrosion of Uranus S1N may be explained by its higher silicon content and a possible segregation of Cr at the GB.

To better understand the influence of silicon, model austenitic stainless steel with a composition based on the chemical composition of Uranus S1N and with Si content ranging between 1 and 4 wt.% were studied. The characterizations of their microstructures as well as the results of the corrosion tests performed on those model alloys in oxidizing nitric media will be presented. Those results, in addition with those obtained on the industrial heats, will allow to propose an explanation of the resistance of Uranus S1N to Intergranular Corrosion.