Pitting corrosion behavior of a ferrite-martensite-austenite multiphase stainless steel – effect of cooling rate

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Abstract Cooling rate has a non-negligible impact on the microstructure of stainless steel, which influences the pitting corrosion resistance. However, there remains controversial on whether decreasing cooling rate deteriorate or improve pitting corrosion resistance. In this study, the effect of cooling rate on the pitting corrosion behavior of a ferrite-martensite-austenite multiphase stainless steel has been investigated, with the help of electrochemical testing, scanning electron microscopy, energy-dispersive X-ray spectrometry, and transmission electron microscopy.

The results showed that pitting corrosion potential of the water-quenching sample is lower than the air-cooling sample, which attributes to the composition change among phases. Pitting corrosion potential of the furnace-cooling sample is lowest compared with the water-quenching and air-cooling samples, which is attributed to the precipitation of Mo-rich χ phase.

Keywords Multiphase stainless steel; Pitting corrosion; χ-phase