

Static Strain Aging in Ferritic and Austenitic Stainless Steels

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Abstract : Static strain aging occurs when metallic materials are subjected to deformation and then heat treated at low temperatures such as 150-200oC. Static strain aging occurs in BCC metals and results in increasing yield and tensile strength and decreasing ductility due to carbon and/or nitrogen atoms locking dislocations. The locked dislocations increase yield and tensile strength. In this study, static strain aging behaviors of ferritic and austenitic stainless steel were investigated. Ferritic stainless steel was prestained at %5, %10 and %15 and then aged at 150oC and 200oC for 30 minutes. Austenitic stainless steel was also prestained at %20 and %30 and then heat treated at 200, 400 and 600oC for 30 minutes. After the heat treatment, the tensile test was performed to determine the effect of prestain and heat treatment on the steels. Hardness measurements and detailed microstructure characterization were also done. While AISI 430 ferritic stainless steel sample which was prestained at 15% and aged at 200oC, showed the highest increasing in the yield strength, AISI 304 austenitic stainless steel which was prestained at 30% and aged at 600oC, has the highest yield strength. Microstructure photographs also support the mechanical test results.

Keywords : austenitic stainless steel, ferritic stainless steel, static strain aging, tensile strength

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