

Effect of powder addition and welding process on microstructure and mechanical properties of Ferritic Stainless Steel welds

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Abstract : Ferritic stainless steels are classified as such because the predominant metallurgical phase present is ferrite. These steels are characterized by good resistance to stress corrosion cracking (SCC), pitting corrosion, crevice corrosion (particularly in chloride environments), higher thermal conductivity, low coefficient of heat dilation and lower cost, when compared to austenitic stainless steels. The combination of low cost and good properties has made ferritic stainless steel more and more attractive in various application fields, such as, heat exchangers, petroleum refining equipment, storage vessels, protection tubes, solar water heaters, and exhaust manifold applications. However, ferritic stainless steel steels are associated with many problems during the welding process. These problems are the martensite formation and grain growth, causing a reduction of ductility and toughness. For these reasons, until recently, the application of this group steels is limited in welded structures. The aim of the present study is to investigate the influence of the Ti and Al on the microstructure and mechanical properties of AISI 430 ferritic stainless steel welds produced by GTA welding. The details of tensile tests, optical microscopic observations, microhardness, and Scanning electron microscopy (SEM) fractography, are discussed.

Keywords : GTA welding, ferritic stainless steel, powder addition, welding process, microstructure, mechanical properties, fracture surface