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Evaluation of mechanical properties of TIG welding joint of stainless steel 304

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ABSTRACT

This paper investigated the mechanical properties like Hardness and tensile test of 304 stainless steel joints by tungsten inert gas (TIG) welding. Tensile tests and Hardness were performed and the fracture surfaces were analyzed. The results showed that the joint by TIG welding had highest tensile strength and smallest dendrite size in all joints, while the joint by had lowest tensile strength, biggest dendrite size.

Keywords: Welding, Tensile test, hardness, SS 304

INTRODUCTION

SAE 304 stainless steel is the most common stainless steel. The steel contains both chromium (between 15% and 20%) and nickel (between 2% and 10.5%) [1] metals as the main non-iron constituents. It is an austenitic stainless steel. It is less electrically and thermally conductive than carbon steel and is essentially non-magnetic. It has a higher corrosion resistance than regular steel and is widely used because of the ease in which it is formed into various shapes. [1]

304 stainless steel has excellent resistance to a wide range of atmospheric environments and many corrosive media. It is subject to pitting and crevice corrosion in warm chloride environments and to stress corrosion cracking above about 60 °C. It is considered resistant to pitting corrosion in water with up to about 400 mg/L chlorides at ambient temperatures, reducing to about 150 mg/L at 60 °C [2].

304 stainless steel is also very sensitive at room temperature to the thiosulfate anions released by the oxidation of pyrite (as encountered in acid mine drainage) and can undergo severe pitting corrosion problems when in close contact with pyrite- or sulfide-rich clay materials exposed to oxidation.

For more severe corrosion conditions, when 304 stainless steel is too sensitive to pitting or crevice corrosion by chlorides or general corrosion in acidic applications, it is commonly replaced by 316 stainless steel.

304 stainless steel is used for a variety of household and industrial applications such as food handling and processing equipment, screws, [2] machinery parts, and car headers. 304 stainless steel is also used in the architectural field for exterior accents such as water and fire features. It is also a common coil material for vaporizers[3].

Tungsten inert gas (TIG) welding became an overnight success in the 1940s for joining

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