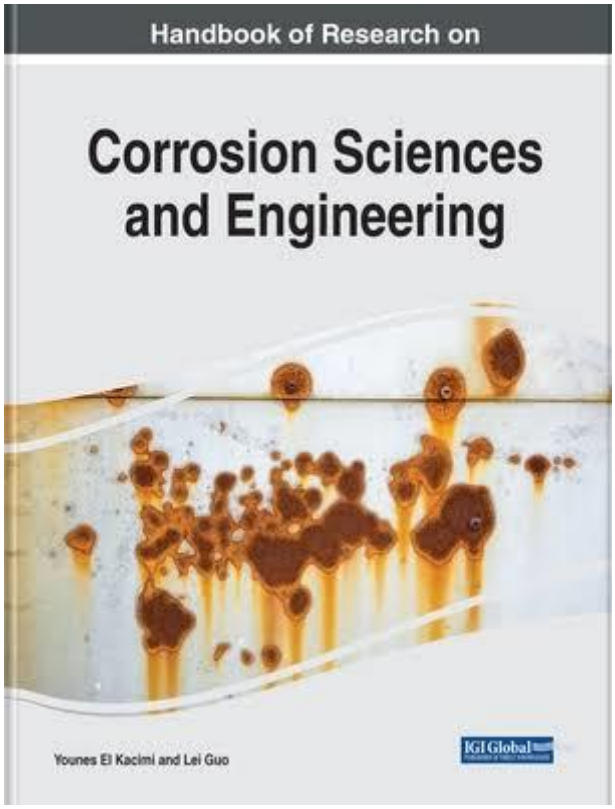

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Chapter 21
Analyzing the Electrical Signals to Understand the Corrosion Presence in Dissimilar Spot Welds Using Austenitic Stainless Steels and Carbon Steels

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ABSTRACT

Welding austenitic stainless steel (ASS) together with carbon steel (CS) is a common practice in spot welding research, but there is a lack of information about the effect of corrosion pertaining to the dynamic resistance, and therefore some surface-corroded carbon steel plates are intentionally welded together with 304L austenitic stainless-steel plates. The welded samples underwent the tensile shear test, hardness test, metallurgical observation, and electrical signal interpretation. Bonding strengths and hardness distributions are both significantly affected by corrosion presence, which reduces the weld strength in overall measure. Microscopic examinations show that the corrosion has randomly scattered around the vicinity of weld nuggets while the electrical signal distinguishes the corroded weld over good welds in terms of electrical resistances.

INTRODUCTION

Austenitic stainless steel (ASS) and carbon steel (CS) are regularly welded together in resistance spot welding research but the surface cleanliness of the carbon steel side that contains corrosion is always an ambiguity (Ajide and Makinde AF. (2011), Nimmo W et al.(2002), Jasmari et al (2011)). In this experimental study, some dissimilar weld joints that contained corrosive particles from carbon steel sheet become the prime interest, and therefore, the carbon steel sheets have been exposed to water and air for several days before being welded together with austenitic stainless steel sheets. The amount of corro-

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sion is assumed in terms of surface appearance rather than the days of open-air exposure. Previously similar means of weld joints have been developed by using well-cleaned or uncorroded carbon steels with austenitic stainless steel coupons (Nachimani Charde (2013, 2014). Such joints have yielded good weldability characteristics between these two materials despite asymmetrical shapes. Similar researches have echoed a similar consensus, concerning the heat imbalances that create the asymmetrical weld joints (Nachimani Charde, 2016). As far as the process parameters are concerned, then the welding current and welding time with constant electrode force and unchanged electrode tips have directly influenced the weld growth(Nachimani Charde,2014). In similar mean, the welding current (kA) and welding time (Cycle) have been gradually increased to compute the changes.

Experimental Methods

Both materials, the carbon steel and austenitic stainless steel, are prepared in a rectangular shape, having a length of 200 mm with a width of 25 mm in 1 mm thickness (figure 1). The chemical properties are listed in table 1 and the welding curves are shown in figures 2 and 3, respectively.

Figure 1. Lap joint of stainless steel and carbon steel sheets

Table 1. The chemical properties of base metals

304L Austenitic Stainless Steel							
Element	C	Cr	Ni	Mn	Si	S	P
	0.048	18.12	8.11	1.166	0.501	0.006	0.030
Carbon Steel							
Element	C	Cr	Ni	Mn	Si	S	P
	0.23			0.90	0.006	0.050	0.040