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XPS Study of Corrosion Deposit in Stainless Steel Hardfacing

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Hardfacing is a widely used method to service life extensión of the surfaces in continuous caster rolls subjected to severe wear, corrosion or oxidation. Martensitic stainless steels within the 12 % chromium alloys are the most used steels to hardfacing, nitrogen can be added to for cladding applications as an to carbon sustitute to increase hardness and form austenite at elevated temperatures [1,2]. The Heat input (HI) is one of the important variables refers to quality of the welding. Due to the heat input and the slow cooling rate occurs after welding, detrimental residual stresses are generated to the mechanical properties and / or corrosion in service. The leading steel companies in the world are located in coastal areas, where the continuous caster rolls are subject to corrosive environments as seawater. This work studies electrochemical corrosion behavior of martensitic stainless steels in synthetic seawater deposited as hardfacing, weldment have been obtained using an automatic flux-cored arc welding process (FCAW). The rolls were surfaced with a 414N-O tubular wire, a nitrogen-bearing, low-carbon wire that produces a martensitic deposit with a composition optimized for corrosion resistance. Figure 1, shows EDS result after the electrochemical test in seawater, can be seen of product obtained has concentrations of oxygen, chromium and iron. Figure 2, shows XPS result of corrosión products, where can see shape and composition of O 1s core-level spectra, presence of oxide, (oxy)-hydroxide, and water can be deduced from O 1s peak fit. Peaks at ~540 eV originate from molecular oxygen (O_2) due to ambient air. Shape of Fe 2p core-level spectra, where presence of oxide, (oxy)-hydroxide, and metallic iron can be deduced from Fe $2p_{3/2}$. Shape of Cr 2p core-level spectra, where presence of oxide, hydroxide, and metallic Cr^0 can be deduced from Cr $2p_{3/2}$ [3]. Can be concluded that Fe is found as oxide while oxy-hydroxides appear combined with Cr and Fe.

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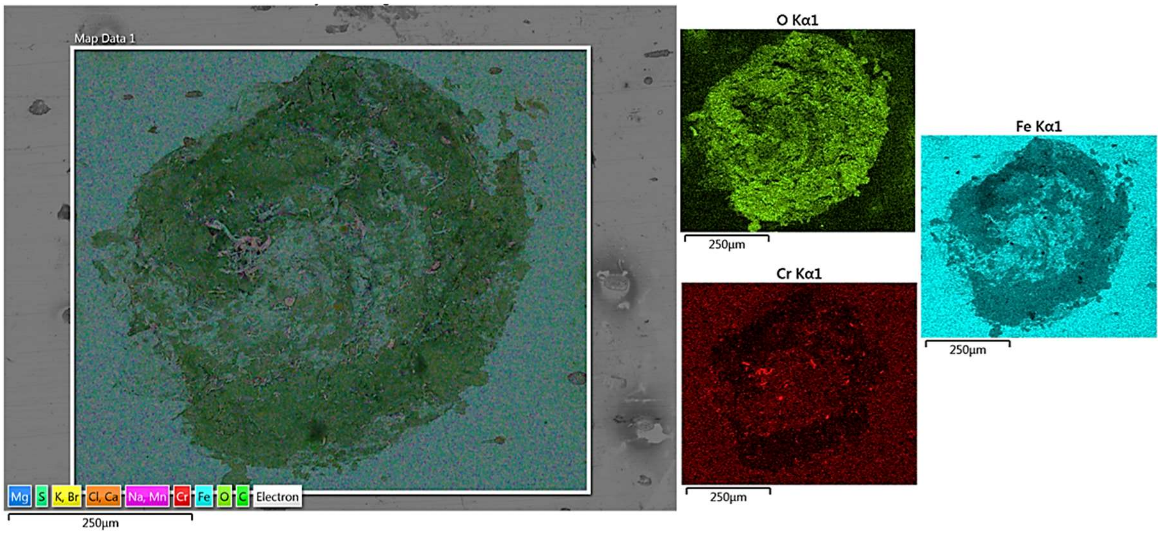

Figure 1. SEM-EDS general result after the electrochemical test in seawater.

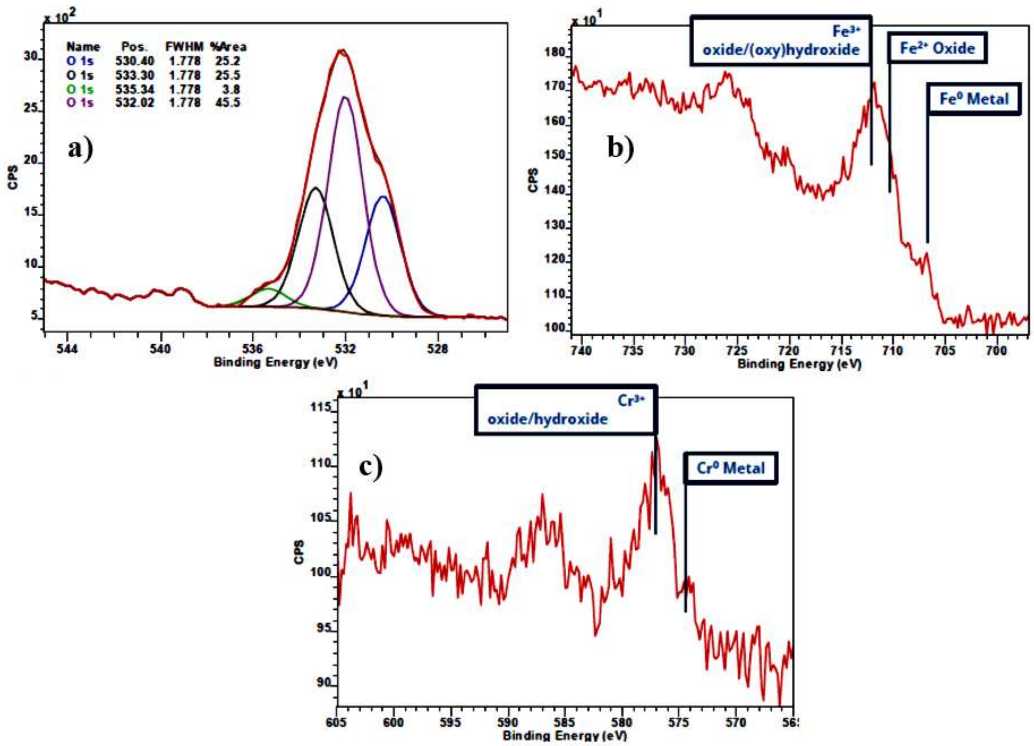

Figure 2. XPS results of: a) O 1s detail spectra, b) Fe 2p detail spectra and c) Cr 2p detail spectra.

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