

SEM imaging and EDX of plasma induced oxides on different phases in duplex stainless steel

Črtomir Donik, Irena Paulin, Aleksandra Kocijan , and Monika Jenko

1. Institute of Metals and technology, Department of surface engineering and applied surface science Lepi pot 11, SI-1000 Ljubljana, Slovenia

crtomir.donik@imt.si

Keywords: duplex stainless steel, SEM, plasma oxidation, oxides

Surface oxidation of the duplex stainless steel DSS alloy 2205 was studied by EDX and SEM imaging. The experiments were performed on the alloy after controlled oxidation with oxygen atoms created with an inductively coupled plasma. Experiments were performed at elevated temperatures 500 °C to 700 °C. Compositions of the modified oxidized surfaces were obtained from EDX scans. The morphologies of the surfaces were obtained using field emission scanning electron microscopy at different magnifications, up to 10,000 ×. It was observed that different phase in duplex stainless steel forms different oxide on the top surface. Differences were in chemistry of the oxides, the morphology and also in the coloration of the oxides on SE images. Different Fe/Cr/Mn oxidized layers and different oxide thicknesses were observed and correlated with temperature.

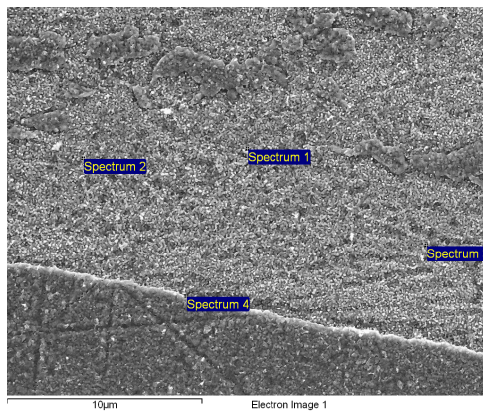


Table 1: EDX spectra of marked 'bright' oxide

Spectrum	O	Si	Cr	Mn	Fe	Ni	Mo
Spectrum 1	7.91	0.88	15.68	1.37	66.53	5.25	2.39
Spectrum 2	9.32	0.80	16.82	1.98	63.11	5.77	2.21
Spectrum 3	7.96	0.72	17.16	1.51	64.24	5.62	2.79
Spectrum 4	3.65	0.56	19.81	1.24	68.93	5.82	

Figure 1. SE images of 'bright' oxide of duplex stainless steel

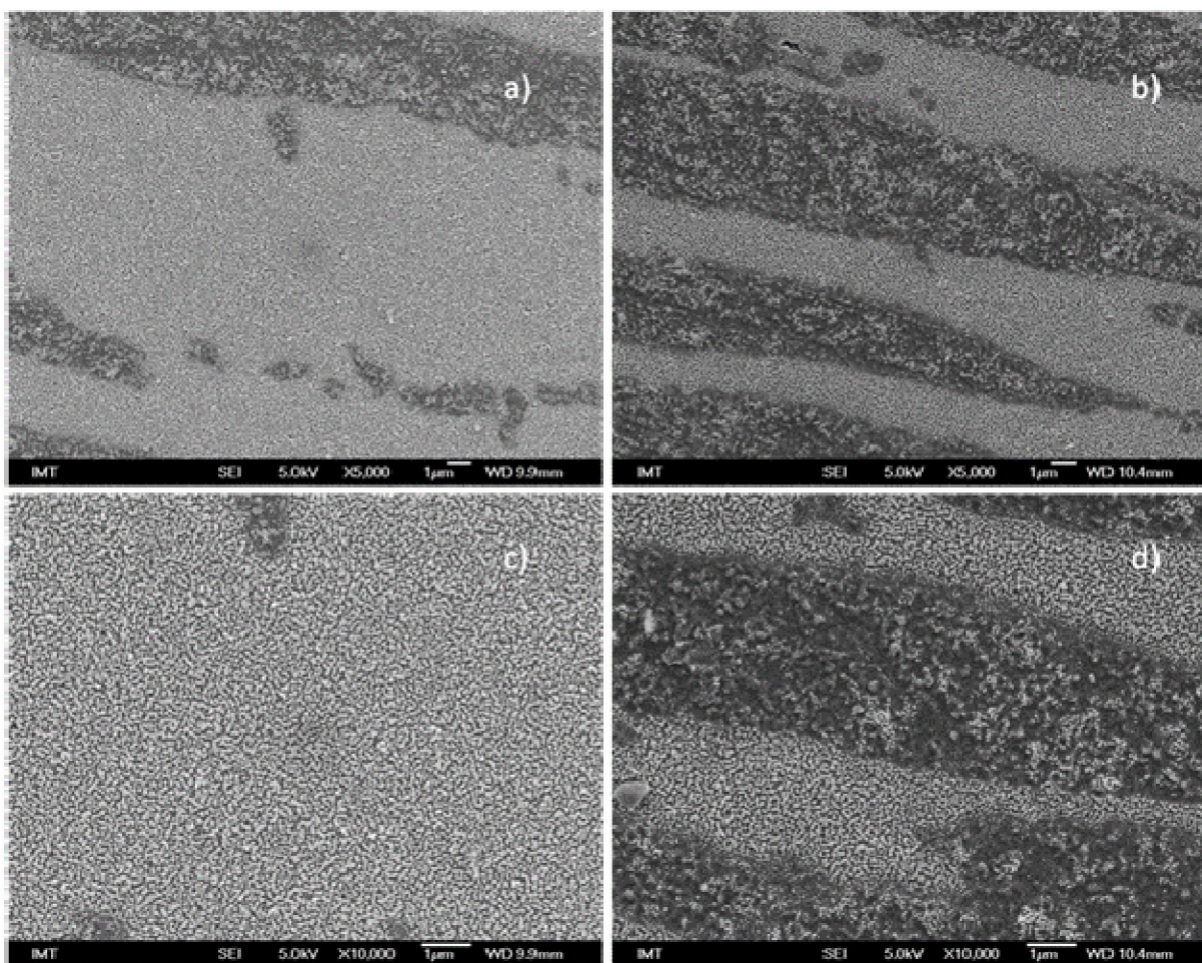


Figure 2. SEM images of a) and c) of DSS oxidised by atomic oxygen at 500 °C ; b) and d) oxidation at 700 °C at lower and higher magnifications respectively.