

TEM Characterization of Oxides on Duplex Stainless Steel

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Keywords: TEM, oxides, duplex stainless steel

Duplex stainless steel (DSS) is widely used material for its mechanical properties and economical production. To improve and extend the properties it is necessary to investigate all the influence on material during its production. One of the undesired properties of steel is degradation and corrosion of the stainless steels as a result of not properly cleaned surfaces after the production.

Steel sheet DSS alloy 2205 [1], 12 mm of thickness, was produce by standard method for thick steel sheets with continuous casting, hot rolling, recrystallization and sandblasting. Scale on the surface may aggravate the properties of stainless steels and disturb the processing of material. Unfortunately scale on the surface of sheets is not completely removed with sandblasting. Remainder of oxides was studied by transmission electron microscopy (TEM).

Some figures of oxides were taken on the thinnest places of the sample (Figure 1) and some EDS analyses (Figure 2) were made on those places. Oxides that occur on the surface are mainly CrO_x type [2]. The most common oxide is Cr_2O_3 . Because of heat treatment (recrystallization) of material some elements like Mn, Fe, Mo, segregated on the surface of steel where oxides are formed. Analyses confirmed formation of Cr-oxides, Fe-oxides and Mn-oxides. Those oxides are also confirmed with X-ray photoelectron spectroscopy (XPS) [2].

1. Donik, Č., Kocijan, A., Mandrino, D., Paulin, I., Jenko, M., Pihlar, B., Applied Surface Science. In Press, Accepted Manuscript.
2. Donik, Č., Kocijan, A., Grant, J. T., Jenko, M., Drenik, A., Pihlar, B., Corrosion Science 51 (2009) p827.

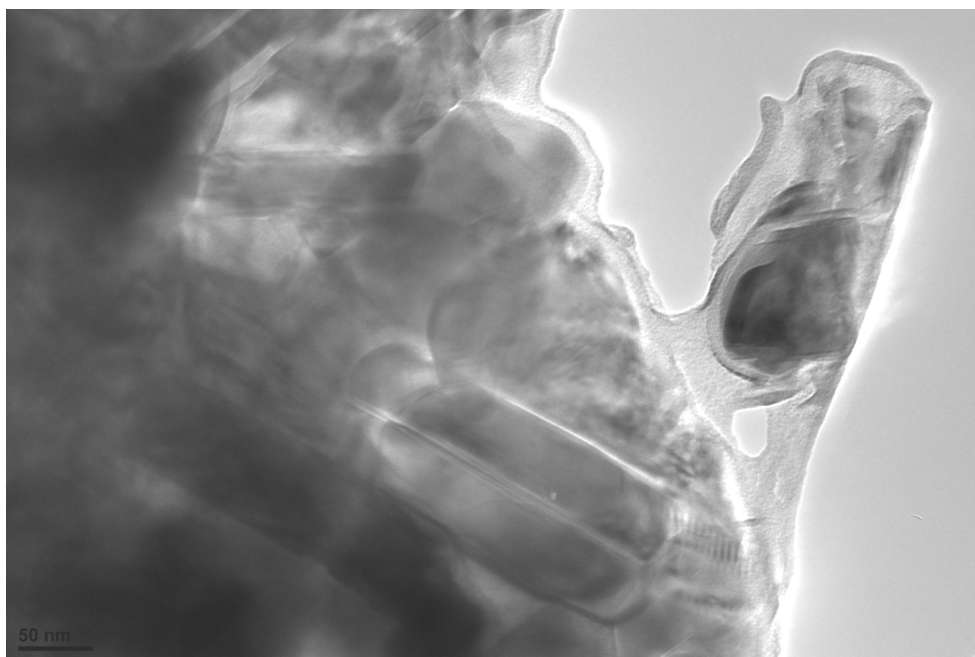


Figure 1. TE image of surface oxidation of duplex stainless steel (mark 50 nm).

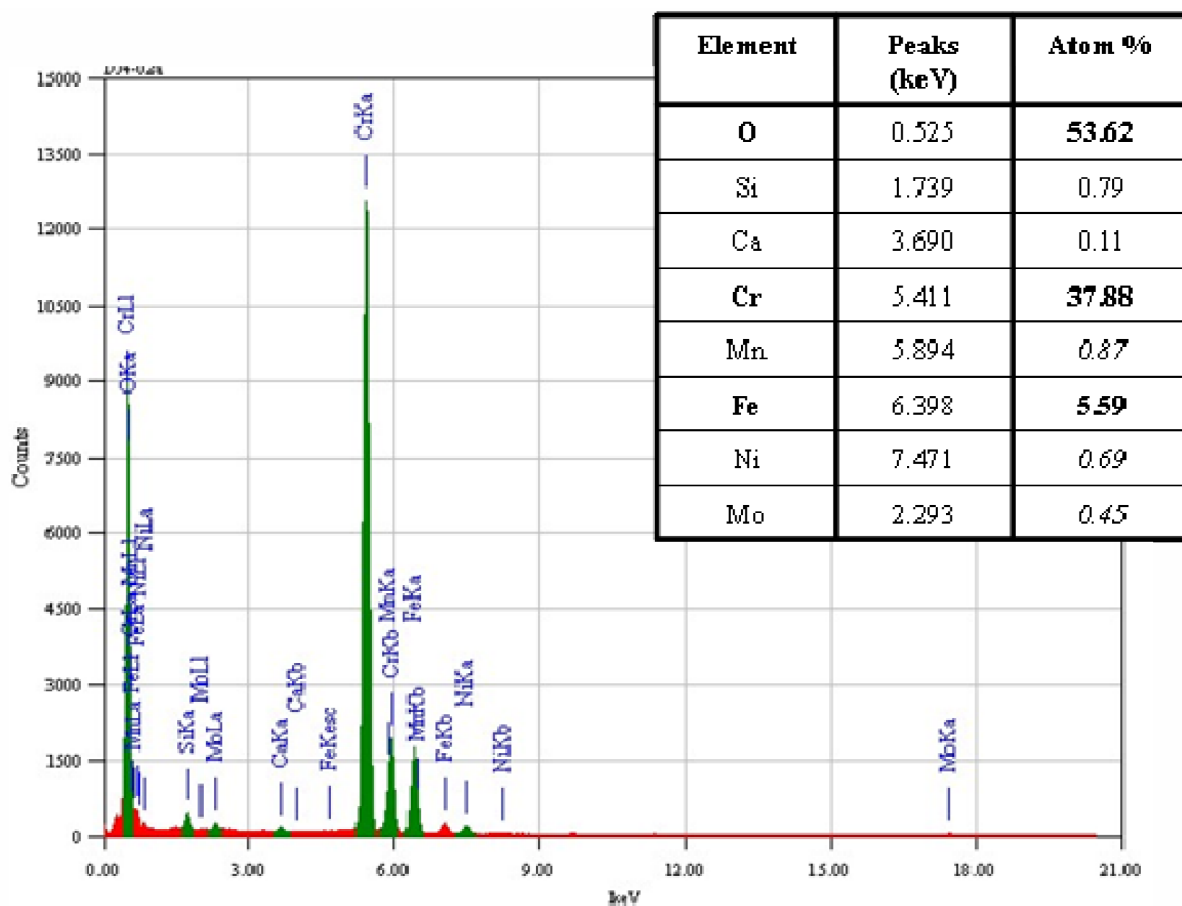


Figure 2. EDS specter and table of chemical elements on surface oxidation of duplex stainless steel.