# Investigation of oxide layers produced on the stainless steel after annealing

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Austenitic stainless steels are widely used in aviation and chemical industries. The most popular is AISI 321 alloy because is highly resistant to chemical corrosion and oxidation. However, these processes are quite complex.[1] Therefore, to improve the alloy's performance and to better predict its service life, it is necessary to achieve the full understanding of the alloy - oxygen interaction.

In this study, the structure, chemical composition and topography of oxide layer produced on the surface of the AISI 321 austenitic steel in the annealing process were analyzed. The analysis was carried out using the following devices: a scanning electron microscope (SEM) equipped with an energy-dispersive X-ray spectrometer (EDX), an atomic force microscope (AFM) and a secondary ion mass spectrometer with time-of-flight mass analyzer (TOF SIMS).

As a result of annealing of the AISI 321 steel, the formed oxide layer consisted of sub-layers differing form each other with chemical composition. In the oxides layer the different type of Fe-O, Cr-O, (Fe,Cr)-O, Ni- O, Ti - O clusters were observed. The results for the depth profile showed presence of stable phases of oxides. Using the Plog's model[2], which describes the relative ion yield of fragments as a function of the different charge and cluster size, we found Cr-O, Fe-O, Ni-O maxima on the Plog`s curves, which allow to calculate the oxidation state of the material.

[1] W. Bochnowski, A. Dziedzic**,** S. Adamiak, M. Berchenko, N. Trzyna, J. Cebulski, Archives Metallurgy and Materials **60**, 3 (2015).

[2] C. Plog, L. Wiedmann, A. Benninghofen, Surf. Sci. **67**, 565 (1977).