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Microstructure and high temperature properties of Al rich diffusion zone on the surface of 9% Cr steel P92

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The state of the art steam power plants operated on fossil fuels as well as renewable power generating systems require the wide range of the parts and the unites made of the high temperature resistant materials. It is known that one of the possible ways of increasing the overall efficiency of the plants in the course of reduction in the emission of carbon containing pollutants in the atmosphere is the rising of working temperatures in some of their critical segments. This, in its turn, requires modernization and optimization of the already existing HT materials. P92 is a commercially available ferritic/martensitic 9% Cr steel which is widely used in the power plants at the temperatures up to 600^{O}C, meeting all crucial requirements from the mechanical- and corrosion resistance standpoints. But the foreseen increased operating temperatures in the future power plants are envisaged to be far beyond those P92 steel was designed for. Improvement of the high temperature oxidation resistance of this steel through the application of Al coating by slurry method was successfully accomplished. HT discontinuous oxidation tests were performed on slurry aluminized and uncoated P92 samples in the laboratory atmosphere for 3000 hours at 650^{O}C and 750^{O}C. In contrast to the uncoated P92, which is a chromia former material, TGO on slurry aluminized steel P92 was found to be alumina. The considerable decrease in the oxide growth rate was detected on the aluminized samples at both oxidation temperatures. The microstructure of the Al diffusion zone and that of the protective oxide scale developed during long term HT experiments was comprehensively studied from the top surfaces and cross sections of samples. For that the SEM/EDS, FIB (slicing tomography mode), XRD and EPMA methods were complexly utilized.

Biography

The presenting author is research professor at the Republic Center for Structure Research of the Georgian Technical University, Georgia. She has a proven track record in the field of materials science and is well known in high temperature corrosion community. She has a very wide international working experience and longtime collaboration with the researchers in the materials field from Germany, France, USA and Spain. She has more than 50 publications and has been PI of many national and international scientific research projects already accomplished or ongoing. Dr.Tsurtsumia is an Alexander von Humboldt fellow and two fold Fulbright scholar.

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