High-temperature oxidation behavior of T92 steel pipes coated with Ni-based alloy by HVOF

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The present research is focused on the analysis and characterization of the high-temperature oxidation behavior of T92 (9Cr-1.75W0.5Mo) ferritic-martensitic steel substrate coated by Ni-based alloy powder. High-velocity oxygen-fuel (HVOF) technique has been employed for coatings deposition of the external surface of T92 steel pipes.The aim of the research is the development of a coating with the ability to increase the service temperature of this steel for its implementation in the energy industry. The tested steel tubes have been particularly considered for their application in different components of advanced thermal power plants.The oxidation mechanisms at high temperature have been analyzed by isothermal and cyclical thermal tests. The behavior of these materials has also been compared varying both temperature and exposure time. These tests have been carried out on both the base steel substrate and the coated materials.The coatings obtained by the HVOF technique have been characterized before and after thermal tests by scanning electron microscopy (SEM) to establish the protection ability of the coating. In addition, XRD technique has been used to analyze the oxides formed after the exposure to high temperatures.The results obtained in the present research confirmed the viability of HVOF technique to achieve coatings with the optimal properties (oxide content, thickness, roughness, adhesion, and micro-hardness) for their application in T92 steel pipes subjected to high temperatures.