

Characterization of Nanostructured and Conventional TiAlN and AlCrN Coated ASTM-SA213-T-11 Boiler Steel

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Abstract : The main objective of the present work is microstructural and mechanical characterization of the conventional and nanostructured TiAlN and AlCrN coatings deposited on T-11 boiler steel. In case of conventional coatings, Al-Cr and Ti-Al metallic powders were deposited using plasma spray process followed by gas nitriding of the surface which was done in the lab with optimized parameters after conducting several trials on plasma-sprayed coated specimens. The physical vapor deposition process (PAPVD) was employed for depositing nanostructured TiAlN and AlCrN coatings. The field emission scanning electron microscopy (FE-SEM) with energy dispersive X-ray analysis (EDAX) attachment, X-ray diffraction (XRD) analysis, atomic force microscopy (AFM) analysis and the X-Ray mapping analysis techniques have been used to study surface and cross-sectional morphology of the coatings. The surface roughness and micro-hardness were also measured. A good adhesion of the conventional thick TiAlN and AlCrN coatings was found. The coatings under study are recommended for the applications to super-heater and re-heater tubes of the boilers based upon the outcomes of the research work.

Keywords : nanostructure, physical vapour deposition, oxides, thin films, electron microscopy

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