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A high-silicon anti-oxidation coating for carbon steel at high temperature

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Abstract:

A high-silicon anti-oxidation coating for carbon steel at high temperature was prepared, which was mainly composed of high-silicon carbide, chromium and binder. The anti-oxidation performance of the coated and uncoated specimens were investigated from 900°C to 1150°C maintained for 60 and 120 min, respectively. Compared with the uncoated specimen, the high-silicon coating could enhance the anti-oxidation effect ~77% at 1000°C for 60 min and 85% at 1050 °C for 120 min, respectively. Scanning electron microscope and Energy Dispersive Spectrometer, X-ray Diffraction and TG-DTA technology were used to investigate the protection mechanism of high-silicon coating. First, during high-temperature treatment, there was a big blister formed in the coating because of the chemical reactions of the compositions, which isolated the steel substrate from oxygen. Second, it was found that a series of materials (such as $\text{Fe}_{2.35}\text{Si}_{0.65}\text{O}_4$, $\text{Fe}_{2.45}\text{Si}_{0.55}\text{O}_4$, $\text{Fe}_{2.95}\text{Si}_{0.05}\text{O}_4$ and FeCr_2O_4)

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