

Corrosion behavior of metal materials in simulated high-temperature flue gas environment

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Firstly, the failure analysis of an analytical tower that used for desulfurization and denitrification was conducted, heating zone, cooling zone, and SRG section/ segment. Based on the characteristics of their respective service environments, the failure mechanisms of each segment were analyzed, and thus the possible corrosion mechanism and its influence factors were clarified. Based on the severe problem of corrosion failure caused by high temperature flue gas, several materials are used for selecting the potential candidate for the analytical tower tube material. According to the results of failure analysis and the test factors that may affect corrosion, a special high-temperature flue gas corrosion test was designed. A self-built steam/ steam-gas environment simulation test equipment that could introduce as most as six kinds of polluting atmosphere simultaneously was used to carried out the high-temperature flue gas test, by using which, the corrosion behavior of two kinds of materials, ND and 2205 duplex stainless steel were investigated. With the prolongation of time, the corrosion of ND and 2205 duplex stainless steel was enhanced. By comparing the electrochemical results of the two kinds of metals, 2205 duplex stainless steel show better relative smaller electric current density and larger corrosion resistance, indicating its better corrosion performance. The unchanged semiconductor type, enrichment of Cr in the passive film are observed as the reason for its excellent behavior. While the time-environment induced variations of film structure and doping concentrations are responsible for the degradation of the protective passive film. Finally, the potential candidate material for analytical tower was determined.

