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(54) Title: HIGH PERFORMANCE ALLOYS WITH IMPROVED METAL DUSTING CORROSION RESISTANCE

(57) Abstract: Alloy compositions which are resistant to metal dusting corrosion are provided by the present invention. Also provided are methods for preventing metal dusting on metal surfaces exposed to carbon supersaturated environments. The alloy compositions include an alloy (PQR), and a multi-layer oxide film on the surface of the alloy (PQR). The alloy (PQR) includes a metal (P) selected from the group consisting of Fe, Ni, Co, and mixtures thereof, an alloying metal (Q) comprising Cr, Mn, and either Al, Si, or Al/Si, and an alloying element (R). When the alloying metal (Q) includes Al, the multi-layer oxide film on the surface of the alloy includes at least three oxide layers. When the alloying metal (Q) includes Si, the multi-layer oxide film on the surface of the alloy (PQR) includes at least four oxide layers. When the alloying metal (Q) includes Al and Si, the multi-layer oxide film on the surface of the alloy (PQR) includes at least three oxide layers. The multi-layer oxide film is formed in situ during use of the alloy composition in a carbon supersaturated metal dusting environment. Advantages exhibited by the disclosed alloy compositions include improved metal dusting corrosion resistance at high temperatures in carbon-supersaturated environments having relatively low oxygen partial pressures. The disclosed alloy compositions are suitable for use as the inner surfaces in reactor systems and refinery apparatus.