The Oxidation-Sulfidation Behavior of Multiphase Mo-Si-B Alloys

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The high-temperature corrosion behaviors of Mo-Si-B alloys under oxidizing and sulfidizing conditions are being studied for possible use in advanced coal-based energy systems. Molybdenum is known to sulfidize fairly slowly and there has been recent progress in developing Mo-Si-B alloys with improved toughness and oxidation resistance at high and intermediate temperatures. Alloys of Mo-Mo_5SiB_2-Mo_3Si with different compositions and phase morphologies were isothermally and cyclically oxidized in dry air or exposed to an H_2-H_2S-H_2O-Ar environment (p_{S2} = ~10^{-6} atm, p_{O2} = ~10^{-20} atm). Effects of the multiphase nature (composition, morphology) of the Mo-Si-B system on corrosion product formation was evaluated. Preliminary analyses suggested that sulfide formation mimicked the starting alloy microstructure while reactions with oxygen as the sole oxidant reflected cooperative behavior among the different phases. Low corrosion rates under sulfidizing conditions were observed and moderate-to-good high-temperature oxidation resistance was found for certain cases.

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