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Microstructure of AlCrFeNiMn High Entropy Alloy and Its Corrosion Behavior in Supercritical CO_2 Environment

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Abstract : High entropy alloys (HEAs) have aroused significant concern in high-temperature supercritical carbon dioxide (S-CO2) environments due to their unique microstructures and outstanding properties. However, the anti-corrosion ability and mechanism of these HEAs in the S-CO_2 remain unclear. Herein, we developed a new AlCrFeNiMn (AM)-HEA with double phases by vacuum arc melting furnace. The corrosion behavior of AM-HEA in the S-CO_2 at 500 ℃ under 25 MPa for 400 hours was deciphered by multiple characterization techniques. The results show that the discrepancy of corrosion between the matrix and boundary was accounted for by their microstructure and components. The role and mechanism of Mn contents for their oxide scales in boundary zones were emphasized. More importantly, the nano-precipitated second phase and numerous boundaries for the outstanding anti-corrosion ability of the matrix were proposed.

Keywords : high entropy alloy, microstructure, corrosion, supercritical carbon oxide, AlCrFeNiMn
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