

High Temperature Oxidation Behavior of CrMnFeCoNi High-Entropy Alloy

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High temperature oxidation behavior of CrMnFeCoNi high-entropy alloy was investigated in oxygen at 600-1100°C by thermogravimetric technique. The composition of each element is 20 at% in an experimental alloy. Oxidation rates observed by mass change measurement were generally smaller in comparison to those of each single element. The values of mass gains were slight larger against those of pure Ni or Ni-based superalloys at the same temperatures in oxygen. Mass gain curves almost obeyed on parabolic rate law, and had larger magnitudes as oxidation temperature increased. X-ray diffraction analysis revealed that the scale formed on the alloys consisted of Mn₂O₃ and Cr₂O₃. Although Mn originally has a larger oxidation rate, that of the CrMnFeCoNi alloy was relatively small because of protective nature of Fe-Cr spinel oxide film. One of the reasons was considered from the viewpoint of thermodynamics that Mn and Cr have larger negative Gibbs free energy change of oxidation reaction among the five elements of the alloy.

Keywords : Cantor alloy, mass gain, oxygen, thermodynamics