Effect of yttrium content on high temperature oxidation resistance of Fe-Ni alloys

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Background

Fe-Ni alloys have been widely used in nuclear energy and aerospace fields due to their excellent resistance to high-temperature creep, oxidation and corrosion. Adding appropriate rare earth (RE) elements to the alloys could be a viable way to substantially improve their properties.

Sample Preparation

Raw materials were smelted into button ingots using an arc melting furnace. The ingots were cut into pieces with a diameter of 1.5 cm and a thickness of 0.1 cm by electrical discharge machining (EDM). Afterwards, the samples were polished with sandpapers and rinsed in absolute alcohol. Samples were annealed at 700 °C for 72 hours for homogenization, and the annealed samples were then oxidized at 1000 °C for 36 hours to examine their oxidation resistance.

Mechanical Properties & Oxidation Resistance

The current results show the feasibility of using yttrium to enhance the mechanical and anti-oxidation properties of Fe-Ni alloys, and preliminarily establishes the phase-constitutionsicrostructure-property relationships in yttrium-containing Fe-Ni alloys.

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