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A review on fundamental of high entropy alloys with promising high–temperature properties

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ABSTRACT: High entropy alloys (HEAs) have five or more principal elements with four core effects: high entropy, sluggish diffusion, severe lattice distortion, and cocktail effects. These effects lead to some distinct properties of HEAs. Some HEAs are promising for high temperature applications and have the potential to replace Ni-base superalloys as the next generation high-temperature materials, such as high entropy superalloys (HESAs) and refractory HEAs. The microstructures of HESAs consisting of γ and γ' phases are similar to that of Ni-base superalloys. Refractory HEAs contain refractory elements with high melting temperatures. Thus, a number of aspects of HESAs and refractory HEAs are reviewed and discussed in the present paper, including microstructure, density, room-temperature mechanical properties, high-temperature strength, creep behavior, and oxidation resistance. Furthermore, a number of future research topics are suggested, emphasizing on developing high-performance high-temperature materials.

Keywords: High entropy superalloys; Refractory high entropy alloys; High-temperature strength; Oxidation resistance; Density

1. Introduction

The efficiency of heat engines, regardless of the types, increases with increasing temperature. In the power generation industry, such as nuclear, coal-fired and oil-fired, the increase in

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