

Eutectic High-Entropy Alloys

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High-entropy alloys (HEAs) can have either high strength or high ductility, and a simultaneous achievement of both still constitutes a tough challenge. The inferior castability and compositional segregation of HEAs are also obstacles for their technological applications. To tackle these problems, here we proposed a novel strategy to design HEAs using the eutectic alloy concept, i.e. to achieve a microstructure composed of alternating soft fcc and hard bcc phases. As a manifestation of this concept, an AlCoCrFeNi_{2.1} (atomic portion) eutectic high-entropy alloy (EHEA) was designed. The as-cast EHEA possessed a fine lamellar fcc/B2 microstructure, and showed an unprecedented combination of high tensile ductility and high fracture strength at room temperature. The excellent mechanical properties could be kept up to 700 °C. This new alloy design strategy can be readily adapted to large-scale industrial production of HEAs with simultaneous high fracture strength and high ductility.