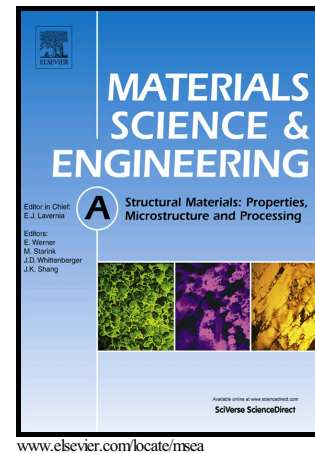


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A promising new high temperature self-lubricating material:**CoCrFeNiS_{0.5} high entropy alloy**

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Abstract

In this study, a novel CoCrFeNiS_{0.5} high entropy alloy (HEA) containing sulfur which simultaneously possesses good mechanical properties and excellent tribological performances is reported for the first time. The CoCrFeNiS_{0.5} self-lubricating HEA was successfully prepared by spark plasma sintering (SPS) via powder mixture of Co, Cr, Fe, Ni and FeS. The SPSed HEA was composed of a face-centered cubic (FCC) phase and a Cr_xS_y phase, and these phases were formed by in-situ reaction of powder mixture during SPS. The FCC phase connected with each other to form the matrix of the HEA, and the Cr_xS_y phase distributed uniformly in the FCC phase matrix. The FCC phase matrix was mainly responsible for good ductility and fracture toughness of the HEA, and the Cr_xS_y phase enabled the HEA to have good strength. The combination of the Cr_xS_y phase and various metal oxides formed on the worn surfaces at high temperatures made the CoCrFeNiS_{0.5} HEA have good tribological properties over a wide range of temperatures.

Keywords: High entropy alloy; CoCrFeNiS_{0.5}; Self-lubricating; Microstructure; Mechanical properties; Tribological properties

1. Introduction

High entropy alloys (HEAs) were firstly reported by Yeh et al. in 2004, and the HEAs have shown immense value of theoretical research and practical application perspective since they

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