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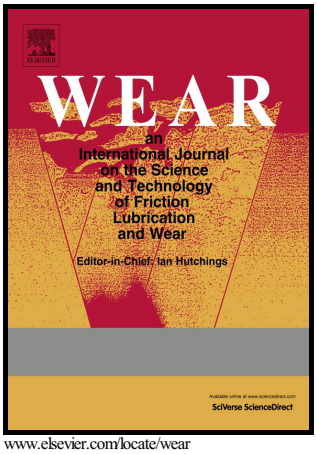

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Wear and Mechanical Properties of Novel $(CuCrFeTiZn)_{100-x}Pb_x$ High Entropy Alloy Composite via Mechanical Alloying and Spark Plasma Sintering

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Abstract

The present investigation reports a systematic study of the effect of Pb addition on microstructural evolution and tribological behavior of equiatomic CuCrFeTiZn high entropy alloy (HEAs).Versatile and interesting properties such as high hardness, reasonable ductility and fracture toughness make HEAs suitable candidates for wear resistance applications. Pb being immiscible with the other alloying elements of the HEA in the solid state is expected to form soft dispersoid in harder HEA matrix, which can act as a lubricant during wear. Different amount of Pb (5, 10 and 20 atom %) were incorporated in the HEA by mechanical alloying (MA) followed by consolidation of MA powder using spark plasma sintering. The X-ray diffraction, SEM and TEM investigations reveal uniform dispersion of Pb in the dual phase HEA matrix. The mechanical and tribological properties of the composites show a good combination of hardness (3.5-6 GPa), compressive strength, plasticity (15-20%) and wear resistance. Efforts are made to relate mechanical properties and wear resistance with microstructure of these novel composites designed by CALPHAD modeling. Computational modeling of surface temperature rise during