Paragraph Ran in the Queries

Paper Title: Rhombohedral phase high-entropy alloy of AlMnCuZnBi as a photo-Fenton catalyst for methyl orange degradation
Content :

Mechanical and magnetic properties

The room-temperature compressive stress–strain curves of bulk $FeCoNi(AlSi)_{0.4}$ and SiO_2-$FeCoNi(AlSi)_{0.4}$ high-entropy alloys (HEAs) after spark plasma sintering (SPS) are presented in Fig. 6. The SiO_2-$FeCoNi(AlSi)_{0.4}$ HEA exhibits higher strength and hardness compared to the SiO_2-free $FeCoNi(AlSi)_{0.4}$. The compressive and yield strengths of the bulk $FeCoNi(AlSi)_{0.4}$ core–shell and SiO_2-free $FeCoNi(AlSi)_{0.4}$ HEAs are 1552.4 MPa and 1278.9 MPa, and 1320.6 MPa and 1250.3 MPa, respectively. Notably, both stress–strain curves display plastic deformation behaviors, and the compressibility (Strain%) for the SiO_2- $FeCoNi(AlSi)_{0.4}$ and SiO_2-free $FeCoNi(AlSi)_{0.4}$ HEAs is 11.9 % and 20.2 %, respectively, indicating excellent compression plasticity for both HEAs. The average Vickers hardness values for bulk $FeCoNi(AlSi)_{0.4}$ core–shell and SiO_2-free $FeCoNi(AlSi)_{0.4}$ HEAs after SPS are measured at 513HV and 425 HV, respectively. The improvement of mechanical properties of SiO_2-$FeCoNi(AlSi)_{0.4}$ high entropy alloy is mainly attributed to the formation of nanotwins(Fig. 5), which has been confirmed in our previous study on SiO_2-$FeCoNiSi_{0.25}$ HEAs[]. The main mechanism can be considered as follows: To coordinate the loading stress in the deformation process, the microstructure evolution of SiO_2-$FeCoNi(AlSi)_{0.4}$ HEAs at the compressive deformation stage gradually changes from dislocation slip to plastic deformation codominated by dislocation and twinning. The dislocation density in the microstructure of the high-entropy alloy increased significantly, and the thickness of the dislocation cell interface decreased gradually with increasing dependent variable, indicating that a large amount of cross-slip was activated, and the upper dislocation entanglement at the dislocation cell interface became more compact. Therefore, the plasticity and strength of the material are increased.