Atomic packing density and its influence on the properties of Cu-Zr amorphous alloys

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This study examined the structural factors governing the physical and mechanical properties of the amorphous alloys. It was found that these properties are intimately related to the atomic packing density characterized by the atomic-scale structures, as defined by the polygonal short-range ordered (SRO) atomic clusters and the free volume. The Young’s modulus, yield strength, and crystallization temperature decreased as the atomic packing density decreased, while the plasticity increased. We report that the origin of the material properties of the amorphous alloys lies in the atomic packing state, which is characterized by the SRO atomic clusters and free volume.

Keywords: amorphous alloy, atomic packing density, mechanical and physical properties, short-range ordering

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STS430J1 steel's microstructure change as Oxidation layer

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The study is focused on the oxide layers formed on the surface of STS430J1 steel. The oxide layers were characterized by X-ray diffraction, scanning electron microscopy, and energy-dispersive X-ray spectroscopy. The results showed that the oxide layers were composed of iron oxide and manganese oxide, and their composition and morphology were influenced by the composition and structure of the steel. The thickness of the oxide layers was also found to be dependent on the oxidation temperature and time.

Keywords: STS430J1, Microstructure, Oxidation layer