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Microstructure and mechanical behavior of Zr–Mo Biomedical alloys

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Zr-Mo alloys show low elastic modulus and low magnetic susceptibilities which are ideal for biomedical applications. In this work Zr-xMo (x = 0, 1, 3, 7.5, 10, and 15 wt.%) alloys were investigated. Ingots were arc melted and subjected to homogenization heat treatment, hot rolling process, solution heat treatment followed water quenching. Water quenched samples were characterization by XDR, visible light microscopy, and Vickers hardness. Microstructural results (i.e. XRD and visible light microscopy) showed that the martensite α' phase was the dominant form for pure Zr and Zr-1Mo content in the water quenched alloys. The β and ω phases were formed in Zr–3Mo alloys while only β phase was observed in Zr-7.5Mo and Zr-10Mo. The Mo2Zr compound was observed in Zr-15Mo alloy. Vickers hardness results showed the lowest value for pure Zr samples (174 HV) whereas Zr-3Mo (β + ω phases) presents the higher hardness (440 HV) due the brittle ω phase. High β-stabilizer samples Zr-7.5 to Zr-15Mo showed values around 300 HV.

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