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高应变率下铸造镁合金AZ91的动态压缩性能及破坏机理

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摘 要： 利用INSTRON准静态试验机和分离式Hopkinson压杆系统对铸造镁合金AZ91在不同应变率下进行压缩试验，研究AZ91镁合金在高应变率范围内(应变率6×10^{2}~1×10^{4} s^{-1})的动态力学行为，并利用扫描电镜观察试样在不同应变率下破坏断口微观形貌的变化，探索应变率对破坏机理的影响。结果表明：室温下铸造镁合金AZ91具有明显的应变硬化性质；在准静态压缩过程中材料对应变率负敏感，当应变率达到7×10^{3} s^{-1}时，AZ91镁合金表现出明显的应变率敏感性；在准静态破坏和动态破坏下，材料断口的微观形貌具有很大不同。

关键字： AZ91镁合金；应变硬化；动态压缩；断口分析

Dynamic compressive behavior and damage mechanism of cast magnesium alloy AZ91

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Abstract: The mechanical behavior of cast AZ91 under a wide range of strain rates (10^{-3}–10^{4} s^{-1}) was described by using INSTRON testing system and Split Hopkinson Pressure Bar. The dynamic behavior (strain rate 6×10^{2}–1×10^{4} s^{-1}) of AZ91 was studied. The fracture surface of samples at different strain rates was examined by scanning electron microscope (SEM). The results show that the cast AZ91 has obvious strain hardening character at room temperature. The mechanical behavior of cast AZ91 declines as the strain rate increases under a low strain rate range (10^{-3}–10^{-1} s^{-1}). When the strain rate exceeds 7×10^{3} s^{-1}, the cast AZ91 shows strong strain rate sensitivity. And the microstructure of the sample's fracture surface exits great difference under different strain rates.

Key words: magnesium alloy AZ91; strain hardening; dynamic compression; fracture analysis