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固体力学与飞行器设计

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聚碳酸酯SHPB系统测量泡沫铝合金动态压缩性能

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Measurement of Dynamic Compressive Behavior of Aluminum-alloy Foams by Polycarbonate SHPB System

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摘要

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摘要 为更加合理、有效地使用泡沫铝,了解其动态冲击下的力学性能是必要的。为提高泡沫材料分离式霍普金森压杆(SHPB)实验的有效性和精度,采用聚碳酸酯SHPB实验系统对泡沫铝合金进行了动态压缩实验,给出了不同冲击速度下的压缩应力-应变曲线,并研究了泡沫铝合金的动态压缩力学特性和变形机制。实验结果表明,高孔隙率的泡沫铝合金的应变率敏感性不强,其动态屈服强度可用静态压缩的实验结果代替。但本结论能否向其他泡沫铝推广,尚有待进一步研究。

关键词: 铝合金 动态压缩 力学性能 SHPB

Abstract: To make use of aluminum foams reasonably and effectively, it is necessary to study their mechanical properties under dynamic impact. In order to increase the validity and precision of split Hopkinson pressure bar (SHPB) experiments for foam materials, dynamic compressive experiments of aluminum alloy foams are conducted by means of a polycarbonate SHPB system, their compressive stress-strain curves are derived at different impact speeds, and their dynamic mechanical behavior and deformation mechanism are discussed. The experimental results show that the strain rate sensitivity of aluminum alloy foams is not significant so that their dynamic yield strengths can be expressed by their static ones. However, further investigation is needed to see if the results derived in this article apply to other aluminum foams.

Keywords: aluminum alloys dynamic compression mechanical properties SHPB

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