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强度失配对铝合金板焊接接头抗弹性能影响的有限元分析

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FEM SIMULATION OF THE EFFECTS OF STRENGTH MISMATCH ON THE BALLISTIC PERFORMANCE OF ALUMINUM WELD JOINT

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摘要

通过建立7.62mm穿甲弹侵彻铝合金板的模型，采用Johnson-Cook材料模型模拟研究了焊接接头的强度失配对铝合金板抗弹性能的影响。研究结果表明：当子弹侵彻铝合金焊接接头附近时，由于材料的不均匀变形，子弹会改变侵彻方向，其方向角的改变大小与子弹速度、侵入位置、弹头形状、强度失配比、靶板厚度有关；当子弹以低速侵彻铝合金板中间的软焊缝材料时，由于变形局部化，出现材料的抗弹性能低于纯焊缝材料的情况；由于子弹侵彻方向的改变，出现部分区域的抗弹性能高于铝合金基体材料的情况。研究结果为不均匀材料的抗弹性能研究提供参考。

关键词: 侵彻　铝合金　有限元　强度失配　抗弹性能

Abstract：

To analyze the effect of strength mismatch on the ballistic performance of aluminum welded joint, a model of aluminum alloy plate penetrated by 7.62mm bullet was created, and the Johnson-Cook constitutive equation was adopted. Results show that the penetration direction will change due to the heterogeneous deformation as the projectile penetrates the aluminum weld joint, and the magnitude of angle change of penetration direction relates to the penetration position, impact velocity, projectile geometry, the rate of strength mismatch and target thickness. When the projectile only penetrates the region of weld seam at a small impact velocity, material's ballistic performance may be worse than that of pure weld seam material due to material deformation localization. There are some regions whose ballistic performances are better than that of aluminum base due to the change of penetration direction. It is useful for the ballistic performance analysis of heterogeneous materials.

Key words：　penetrate　aluminum alloy　FEM　strength mismatch　ballistic performance

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引用本文：

刘文辉,黄 浩. 强度失配对铝合金板焊接接头抗弹性能影响的有限元分析[J]. 工程力学, 2012, 29(11): 289-294.

LIU Wen-hui,HUANG Hao. FEM SIMULATION OF THE EFFECTS OF STRENGTH MISMATCH ON THE BALLISTIC PERFORMANCE OF ALUMINUM WELD JOINT[J].

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