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铝锂合金喷丸强化数值模拟及试验

Numerical simulation and experiment on shot peening of Al-Li alloy

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中文关键词: 铝锂合金 喷丸强化 有限元模拟 残余应力 弹丸模型

英文关键词: Al-Li alloy shot peening finite element simulation residual stress shot model

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中文摘要:

根据喷丸强化工艺过程的特点,利用ABAQUS有限元计算软件建立了模拟喷丸残余应力场的三维有限元模型.在此模型基础上研究了喷丸速度、弹丸直径及弹丸数量等因素对铝锂合金喷丸残余应力场的影响规律,进而对比了单弹丸模型、均布式阵列弹丸模型和随机弹丸模型下残余应力场的分布规律.采用X射线残余应力仪和电解抛光法得到喷丸强化后沿铝锂合金试件厚度方向的残余应力分布规律.残余应力层深度约为0.24mm,最大残余应力出现在距表面深度为0.08mm处,验证了有限元模型的有效性.

英文摘要:

According to the characteristics of shot peening process, a three-dimensional finite element model was established by using ABAQUS finite element software to simulate the residual stress field. Based on this model, the effects of shot parameters such as velocity, diameter and shot number on residual stress field of Al-Li alloy were studied respectively. Then the distributions of the residual stress field of single shot model, uniform array shots model and random shot model were compared. Furthermore, the residual stress distribution in Al-Li alloy specimen thickness direction was measured by using X-ray residual stress analyzer and electrolytic polishing method. The depth of residual stress layer is 0.24mm. The maximum residual stress occurs at the depth of 0.08mm. It verifies the validity of the finite element model.

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