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电解-旋转超声磁粒复合对Tc4板抛光的研究

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摘要: 为了改善Tc4钛合金板材制造零部件的表面质量,降低其表面粗糙度,提出了一种高效率的电解-旋转超声磁粒复合研磨抛光方法。设计了电解-旋转超声磁粒复合研磨抛光的实验装置,对不同加工工艺下所得的合金表面的表面粗糙度、表面残余应力进行分析。结果表明,经过20 min加工后,复合研磨使表面粗糙度由 $1.92\ \mu\text{m}$ 降至 $0.09\ \mu\text{m}$,改善了表面质量。表面残余应力由 $+186\ \text{MPa}$ 转变为 $-51\ \text{MPa}$,即由拉应力变为压应力,获得更好的表面应力状态。

关键词: Tc4板材;电解-旋转超声磁粒复合研磨;表面粗糙度;表面残余应力

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Study on Polishing of Tc4 Plate by Electrolysis-Rotating Ultrasound Magnetic Particle Composite

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Abstract: In order to improve the surface quality and reduce the surface roughness of parts made of Tc4 titanium alloy sheet, an electrolysis-rotating ultrasonic magnetic particle composite grinding method was proposed. The experimental device for the method was designed, and the surface roughness and residual stress of the worked alloy with the device under different processing technic were analyzed. The results showed that the surface roughness reduced from $1.92\ \mu\text{m}$ to $0.09\ \mu\text{m}$ by composite grinding after 20 minutes processing time, which improved the surface quality. The residual stress on the surface was changed from $+186\ \text{MPa}$ to $-51\ \text{MPa}$, it meant the form of stress was changed from tensile stress to compressive stress, which could provide a better state of surface stress.

Keywords: Tc4 sheet; electrolysis-rotating ultrasonic magnetic particle composite grinding; surface roughness; surface residual stress

钛合金以其良好的比强度、耐高温、耐腐蚀性等优点,已成为航空制造业中不可或缺的新型结构材料。随着以波音公司为代表的民用飞机年产量增加,Tc4钛板材的需求量逐年提高^[1]。但Tc4板材

一般通过热轧、冷轧批量生产,成型后的Tc4板材表面质量较差,不能达到使用要求。近些年,科研人员们对Tc4平面抛光做了大量研究,邹松华等^[2]利用电镀镍的工艺对Tc4表层进行镀膜,此方法在

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