

عنوان مقاله:

Investigation and Analysis of Residual Stress in ۳۰۴ Steel FSW Process

محل انتشار:

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خلاصه مقاله:

Friction stir welding (FSW), due to its low energy consumption, high efficiency and good mechanical properties, is widely used in welding ۳۰۴ steel for aerospace applications. However, the problems of deformation, cracking and fatigue damage caused by residual stress have not been solved yet. In this article, the residual stress in FSW of ۳۰۴ steels has been measured by laser ultrasonic technology. According to the FSW process and the characteristics of the thin plate structure, the residual stress of the ۳۰۴-steel sheet is simplified to plane stress. The prestress loading method is presented and the acoustoelastic constants are obtained. With the presence of acoustoelastic constants, longitudinal and transverse FSW residual stresses are measured by laser ultrasonics. The result shows that the residual stress distribution is obviously asymmetric and the residual stress in the forward part is higher than the residual stress in the backward part. Transverse residual stress is less than longitudinal residual stress. Then, the effect of welding speed, rotation speed, tool tilt angle and floatation depth on residual stress is discussed. The results show that the welding speed has a great effect on the residual stress, while the effect of the rotation speed on the residual stress is relatively small. When the welding speed is low, the effect of rotation speed on the stress is more obvious than when the welding speed is high. For the appropriate range that is determined according to engineering experience, the influence of the angle of inclination of the tool and the depth of buoyancy on the maximum longitudinal residual stress cannot be ignored. The research of this article is very important in the use of laser ultrasonic technology in inspecting the quality of welded parts and optimizing the FSW process

کلمات کلیدی:

Ultrasonic, Friction Stir Welding, Residual Stress, ۳۰۴ steel

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