C. The Crystal Orientation of a Vibration Welding Structure

by C.W. Kuo, W. Wu ,National ChungHsing University

AISI 304 stainless steel and Inconel 690 alloy were used in this study. This study focuses on the crystal structure affect by vibration welding between the same lattices, but different precipitate conditions. AISI 304 stainless steel and Inconel 690 alloy have the same phase which is a fully austenitic phase at room temperature. The austenite in the 304 stainless steel is transformed from the ō-ferrite, but the austenite in Inconel 690 alloy is directly precipitated from the melt.

The stead-state vibrations was produce by an eccentric motor, and it applied during all the welding process. The vibration diversity was controlled using the frequency and the specimens were welded while being subjected to 0 and 39.4Hz vibration, respectively. Crystal structure was determined by A MAC SCIENCE MXP3 X-ray Diffractometer. The specs. Were as follows: X-ray wave length: 1.54056A, X-ray tube voltage: 40kV, current: 30mA, scan: from 40° to 100° in 0.02° steps and 1°/min scanning speed. The curve is fitted by Lorentzian function.

Vibration welding allows the atoms in the liquid phase to be deposited in a more regular mode and solidify in a preferred orientated structure. It makes the primary precipitate, δ-ferrite in 304 stainless steel, and γ-austenite in Inconel 690 alloy, form a preferred orientation crystal structure. The γ-austenite of 304 stainless steel is formed by ō → γ solid transformation, during the welding process, vibration leads to un-uniform strain, the diffraction intensity decreases and results in a broadening of the FWHM.