

Evaluation of Joining Strength in Friction Stir Welding of Wrought and Die Casting Aluminum Alloys

Yuki Matsuo¹⁾ Souichiro Nishino¹⁾ Eitaro Yukutake²⁾

1) The University of Ibaraki, Graduate School of Science and Engineering
 4-12-1 Nakanarusawa-cho, Hitachi-shi, Ibaraki, 316-8511, Japan (E-mail: souichiro.nishino.sn@vc.ibaraki.ac.jp)
 2) Industrial Technology Innovation Center of Ibaraki Prefecture
 3781-1 Nagaoka, Ibaraki-machi, Higashiibaraki-gun, Ibaraki, 311-3195, Japan

KEY WORDS: Materials, Aluminum alloy, Joining, Friction stir welding, Wrought and die casting material [D3]

In this study, friction stir welding of similar and dissimilar materials was carried out using die casting aluminum alloy ADC12 and wrought aluminum alloy A5052, A6061 to evaluate the tensile strength and to analyze the fracture of jointed materials. In ADC12 similar joint, the tensile strength was lower than that of base material. Joining efficiency was 86%, and adequate tensile strength of joint was obtained. Softening due to heat generated during friction stirring was not observed. The fracture location was the stir zone. The tensile strength of similar joint is lower than that of the base material due to the different shape and distribution of the Si phase in the stir zone. In dissimilar joints of ADC12 with A5052 and A6061, joining efficiency was more than 80%. Placing a material with lower tensile strength at the Advanced Site will result in higher tensile strength than placing it in the Retreating Site. The fracture location of dissimilar joints was the softened point of the wrought aluminum alloy (A5052, A6061), where the tensile strength of base material is lower than ADC12.

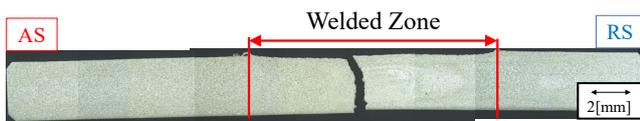


Fig.1 Macrostructure of tensile fractured smoothed specimen of ADC12 similar joint

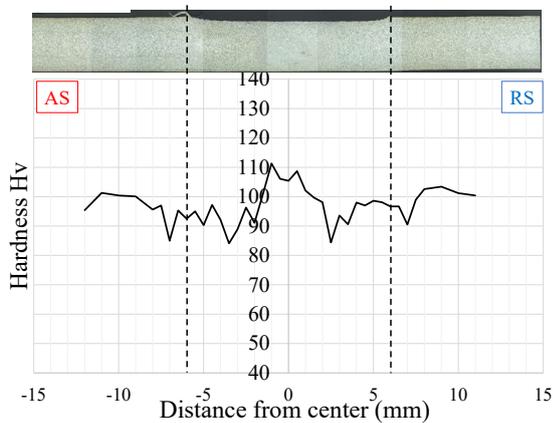
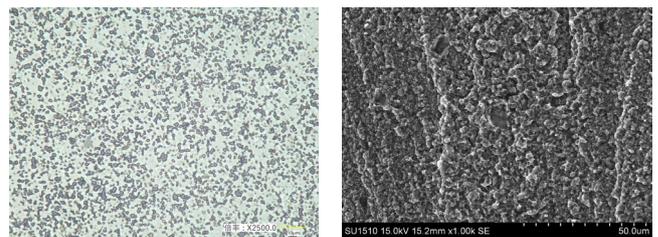
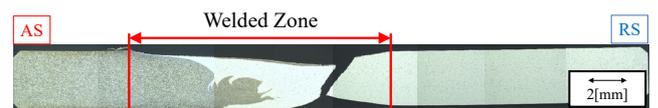


Fig.2 Hardness distribution on cross section FSW joining area of ADC12 similar joint



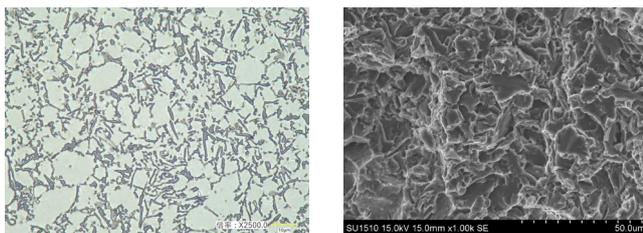
(a)Microstructure (b)Fracture Surface
 Fig.4 Microstructure and fracture surface SEM micrograph of ADC12 similar joint



(a) ADC12(AS)/A5052(RS) dissimilar FS welded joint



(c) ADC12(AS)/A6061(RS) dissimilar FS welded joint
 Fig.5 Macrostructure of tensile fractured smoothed specimen of ADC12 dissimilar joints



(a)Microstructure (b)Fracture Surface
 Fig.3 Microstructure and fracture surface SEM micrograph of ADC12 base material