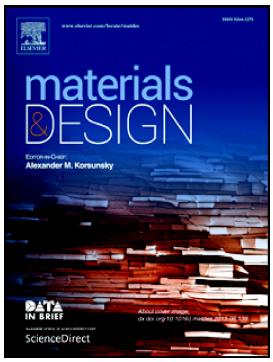

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Studying the effect of lubricant on laser joining of AA 6111 panels with the addition of AA 4047 filler wire

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Abstract:

This paper explores the feasibility of laser joining of aluminum alloy 6111 panels with the presence of lubricant used in the preceding stamping operation. The effects of two commonly used automotive lubricants, Bonderite L-FM MP-404 and Ferrocote 61 MAL HCL lubricant, on the weld quality were investigated. Images captured by a CCD camera showed that the presence of lubricant caused the poor wetting and spreading of the filler wire. The decomposition of lubricant formed hydrogen pores in the weld, promoted the plasma plume with a high intensity, and elevated the temperature of the molten pool. The simulation of rapid solidification revealed that the formation mechanism of pores was related to the temperature distributions and the solidification rates. The comparison of effects of diluted lubricants in different concentrations on the weld surface quality and the mechanical properties provides a reference on an acceptable level of lubricant on the stamped panels prior to welding.

Keyword: Lubricant; laser joining; aluminum alloy