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Measurement of adhesion strength of solid-state diffusion bonding between nickel and copper by means of laser shock spallation method
MANABU SATOU, HITOSHI AKAMATSU, AKIRA HASEGAWA, Tohoku University — Coating and bonding techniques between different materials are essential to the field of technology. Bonding mechanism is of interest from scientific points of view. Several works concerning to the strength such bonding have been revealed that the strength depended on crystallographic orientations, differences of thermal expansion and chemical affinity and so on. The methods adopted for those measurements had uncertainties due to plastic deformation near the interface. A laser shock spallation method was utilized to measure adhesion strength of the bonding in this paper to minimize the deformation outside of the interface. A well-established method to make bonding between unalloyed nickel and copper was utilized, that was solid-state diffusion bonding at elevated temperatures. Irradiation by Nd:YAG laser with 7ns-pulse width created shock wave that caused tensile stress after reflection at free surface. The stress depended on laser power and was estimated by surface velocity profile measured by a laser interferometer. The adhesion strength was determined by the critical laser power that caused exfoliation of the bonding interface.

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