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Joining and Coating of Intermetallic Compounds to Metallic Materials by Reactive Casting

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A novel method for joining and coating of intermetallic compounds based on an exothermic reaction between droplets and powder is proposed, and its feasibility is experimentally examined using nickel monoaluminide (NiAl) as a demonstration material. In an experiment for joining of NiAl, when an aluminum droplet was dropped onto nickel powder fed into the root gap between two NiAl plates, the droplet and powder exothermically reacted and produced NiAl liquid. The heat generated from the reaction melted the joint part of the NiAl plates, and after solidification joining of the NiAl plates was completed. In an experiment for NiAl coating, a small amount of nickel powder was fed onto a steel surface, followed by supplying an aluminum droplet onto the powder. The nickel and aluminum reacted exothermically and produced a NiAl bead on the steel surface, bringing about strong bonding between the NiAl bead and the steel.