

Solid State Synthesis of Ti-Al Composites by Foil Metallurgy

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Ti-Al intermetallic compounds are the most promising materials because of their high specific strength and high heat-resisting properties, although they are not yet used in practice because of their brittleness. Forming a composite with ductile fibers is one of promising methods in solving the problem. Reinforcements, however, can easily deteriorate at a temperature higher than 950 K, which is inevitable for the traditional method of fabricating composites. On the other hand, Ti-Al compounds can be formed at a temperature lower than 950 K by the self-propagating high-temperature synthesis method from pure Ti and pure Al with auxiliary heat, as Ti-Al generates a moderate amount of heat. Uniform TiAl_3 was obtained at 913 K under 30 MPa for 60 min wherein the foils without fibers were laminated simultaneously and hot pressed. Compounds and a composite were formed simultaneously by inserting W fibers between the Ti foils or Al foils in a carbon die. A serious interfacial reaction between the fibers and the matrix was observed when the W fiber was placed between Al foils. On the other hand, an interfacial reaction was not observed when the fibers were placed between the Ti foils.