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Solid state diffusion bonding characteristics at the interfaces of Ti and Al layers

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Abstract

In the present research, the multilayered composites of Ti and Al have been synthesized by hot press and hot roll bonding. The effects of annealing temperature and time on diffusion bonding characteristics of Ti and Al have been investigated. The resulting intermetallic compound at the interfaces of Ti and Al was TiAl_3 which was detected by scanning electron microscopy (SEM) equipped with an energy spectrometer system. Also, the results showed that the thickness of TiAl_3 increased as annealing temperatures and times increased. The growth kinetics of TiAl_3 obeys parabolic behavior and the activation energy TiAl_3 growth was calculated to be 90 kJ/mole. Several voids were observed in Al layers due to the diffusion discrepancy between Al and Ti elements which indicate that the dominant diffusing element is Al. Also, the microhardness of TiAl_3 and the tensile strength of multilayered composites were evaluated to be 300 vickers and 318 MPa.

Keywords: Multilayered composite; Diffusion bonding; Intermetallic compound; Parabolic behavior; Activation energy.

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