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Preparation and mechanical properties of in-situ synthesized nano-MgAl₂O₄ particles and Mg_xAl_(1-x)B₂ whiskers co-reinforced Al matrix composites

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Abstract

Nano-MgAl₂O₄ particles and Mg_xAl_(1-x)B₂ whiskers co-reinforced Al matrix composites were prepared through powder metallurgy and hot working processes, involving ball-milling, cold pressing, sintering, repressing, and hot extrusion. The microstructure, tensile strength and hardness of the composites, the phase composition of the particles and the whiskers, and the interface between the whisker and the aluminum matrix were investigated systemically. The results show that during the hot extrusion, the reinforcements are uniformly distributed in the matrix, and the whiskers are arranged in the direction of extrusion. The whiskers are hexagonal prisms with close-packed hexagonal crystal structure and all the inner angles are 120°. Besides, the whisker elongates along the [0001] crystal orientation, and the six planes of the

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