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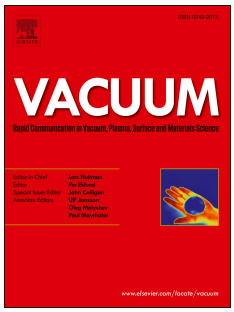

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Microstructure, tribological and mechanical properties of Al7075 / Ti_3AlC_2 MAX-phase surface composite produced by friction stir processing

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Abstract

The effects of friction stir processing and Ti_3AlC_2 particles on the microstructure and mechanical properties of Al 7075 were investigated. Microstructural observations showed considerable grain refinement in the base metal and the aluminum- Ti_3AlC_2 composites. After one pass of friction stir processing, a uniform distribution of particles was not obtained. However, after four passes, particles were uniformly dispersed. After one pass of processing, the yield and tensile strengths of base metal slightly improved. In the composites, however, the strength improvements were about 2-5 % and 19-20 % after one and four passes, respectively. In contrast to strength, ductility of processed samples decreased to various degrees, i.e. 30 % in the base metal and 15 % in the 4-pass processed composite. The microhardness of the base metal, 1-pass and 4-pass processed composites was also improved by about 10 %, 17 % and 33 %, respectively. Grain refinement and uniform distribution of particles were found responsible for the improved mechanical properties. It appeared that the wear mechanism of all processed samples changes from adhesive to adhesive-abrasive at the sliding distance of 200 m. In the base metal, wear behavior was almost adhesive, while in the fabricated composites adhesive-abrasive wear was prevailing.

Keywords

FSP; Ultra fine grain; Metal matrix composite; Wear; Tensile test; Severe plastic deformation.

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