

Polymer derived ceramic reinforced magnesium-based metal matrix composite

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Abstract

For energy saving and environment protection, magnesium is one of the most promising light weight material due to its low density and reasonable specific strength. However, limited ductility and formability of magnesium restrict its usage in different applications. Friction stir processing (FSP) is a promising severe plastic deformation process that can enhance the mechanical properties of magnesium through grain refinement and texture modification. In the current study, FSPed samples showed 2-3 times increase in ductility with similar strength. Making metal matrix composite (MMC) is a well-known technique to improve the strength of the material. So, in the current study we have tried to couple the benefit of both FSP and MMC. To fabricate the MMC, a new method called the 'polymer route' was used to introduce polymer derived ceramic (PDC) reinforcements. In this method, FSP was performed to distribute the polymer particles uniformly in the matrix. High temperature isothermal heat treatment was carried out for in-situ conversion of the polymer particles into ceramics. The strength of the composite so obtained increased about two times as compared to the processed base metal. The mechanism involved in property enhancement were studied in detail.

Keyword : FSP, MMC, Magnesium, PDC