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ժҪ: Orowan Hall-Petch ? c ϵ Ç , ض? ? ? ? ? eķ˛ ? ″ Çӱ 젎 ж,

SiC AZ91D c Ϊ , ?? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ˛ ˗? ? ѧ? ? ? ? ? ? ? ˛ ѧ 徐 ѧ? ? ѧ ȝ˛ ? ″ c ӱ , жԱ : ? ? ? ? ? ? ? ? ˛ ѧ , Ч , Ç ϊOrowan ; ? ? ? ? ? ? ? ? ˛ ѧ , Ч , Ç ϊHall-Petch ѧ? ? ѧ ȝ˛ , , Ч 뾡 C ?

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Influence of nano particle distribution on the strengthening mechanisms of magnesium matrix composites

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Abstract: Orowan strengthening, thermal mismatch strengthening and Hall-Petch strengthening are known as the main strengthening mechanisms of nano particle reinforced magnesium matrix composites. However, the distribution of the particles in the matrix has an important influence on the enhancement effect and determines the dominant mechanism. In this paper the existed strengthening models were modified. The influence of three types of nanoparticle distribution,intragranular, grain boundary and intragranular-boundary distribution, on the yield strength of the nano SiC particle reinforced AZ91D composites was analyzed based on the modified models. The calculated results were compared with the experimental results. The results show that the composite has the best strengthening effect when the particles are completely distributed within the grain and the dominant mechanism will be Orowan strengthening; the composite shows the least strengthening effect while the particles are fully distributed along the grain boundary and the main mechanism will be Hall-Petch strengthening; the multi strengthening mechanisms will work when the particles are distributed both in the grain and on the grain boundary, in which case the strengthening effects will be weakened as the proportion of the fraction of the particle inside the grain to that on the grain boundary decreases.

Keywords: magnesium matrix composites nano particle strengthening mechanisms particle distribution Orowan strengthening thermal mismatch strengthening Hall-Petch strengthening

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