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中间合金中第二相粒子TiC和$TiAl_3$对纯铝的细化作用

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摘 要：研究Al-TiC和Al-$TiAl_3$中间合金中第二相粒子TiC和$TiAl_3$对纯铝晶粒的细化作用。结果表明：当TiC和$TiAl_3$单独作为α(Al)的形核相时，两者的形核能力均较差，但TiC粒子的形核和抗细化衰退能力优于$TiAl_3$粒子的；当第二相粒子TiC和$TiAl_3$共同作为α(Al)的形核相，且加入量适当时，表现出较强的形核能力和抗晶粒细化的衰退能力，细化效果较显著；配成的7组晶粒细化剂中，当细化剂中Ti和C摩尔比为1.81:时，晶粒细化效果最好；这是由于$TiAl_3$在铝熔体中分解释放出Ti原子并向TiC粒子周围偏聚，形成的TiC/铝熔体界面富Ti过渡区促进了TiC粒子在铝熔体中的均匀分布，提高了其形核能力。

关键字：Al-TiC中间合金；Al-$TiAl_3$中间合金；TiC；$TiAl_3$；晶粒细化

Refining performances of TiC and $TiAl_3$ phases in master alloys on pure aluminum

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Abstract: The second phase particles TiC and $TiAl_3$ on the refining performances of pure aluminum particles were studied in Al-TiC and Al-$TiAl_3$ master alloys. The results show that, when TiC and $TiAl_3$ phases are used as the α(Al) nucleation phase, both of the two nucleation capabilities are poor, but TiC particle exhibits better nucleation and higher resistance to grain refining fading than $TiAl_3$ phase. When the second phase particles TiC and $TiAl_3$ are used as the α(Al) nucleation phase

and have a relatively quantity, they demonstrate better nucleation and higher resistance to grain refining fading. The experiments show that, in the seven groups grain refiners, the refining performances of the refiner with mole ratio of Ti to C of 1.81: is the best. The reason is that the TiC/aluminum interface, Ti-rich transition zone, formed by $TiAl_3$ releasing Ti atoms in aluminum melt, Ti atoms congregating to the TiC surface, promotes the distribution of TiC in aluminum melt and advances the nucleation of TiC.

Key words: Al-TiC master alloy; Al-$TiAl_3$ master alloy; TiC; $TiAl_3$; grain refinement

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