been confirmed by recent experimental and theoretical investigations [12,14]. From such magnetic inhomogeneities, one would obtain not only a low spontaneous magnetization for low Ni alloys, but also a thermal expansion higher than the Invar alloy, since the thermal expansion should be an averaged behavior among volume fractions of both ferro- and nonferromagnetic states within the FeNi alloy layers.

3 Conclusions

With X-ray diffraction technique, the thermal expansion behaviors of FeNi alloy layers around the Invar composition have been investigated by using $Fe_{1-x}Ni_x$ /Cu superlattice structures to stabilize the f.c.c. FeNi phase. In addition to the low thermal expansions of FeNi Invar alloy layers which can be expected from that of corresponding bulk materials, a large thermal expansion is observed for the alloy layers with lower Ni concentrations. It is believed that this rise in thermal expansion rate with the Ni content in the alloy decreasing is a result of magnetic inhomogeneities that exist in the FeNi layers of low Ni concentrations.

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Effect of the Solidification Conditions on the Microstructures of $AlSi_7Mg$ Alloy during Semi-solid Remelting

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Abstract: The effect of the solidification conditions on the microstructures was studied during partial remelting of $AlSi_7Mg$ alloy with the help of an electrical pipe-type furnace. The results show that the eutectic is remelted above all and α phases are gradually evolved into spheroidal shape, if the $AlSi_7Mg$ alloys stirred strongly by rotating electromagnetic field during the first solidification are heated again to 589 or 597℃ and have been held for a short time (for example, 5～10 min), and moreover, the higher the holding temperature, the faster the eutectic remelting process and α phase's evolution are. In contrast, even though the $AlSi_7Mg$ alloy's samples non-stirred with fine dendritic microstructures are heated to the same temperatures as those stirred by rotating electromagnetic field and have been held for 60 min, it is not possible to change all the dendritic α phases to speroidal α phase.

Key words: $AlSi_7Mg$; remelting; electromagnetic stirring; dendrite

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