

Microstructure transition and grain refinement mechanism of undercooled alloys

ABSTRACT

The solidification microstructures of undercooled Ni₉₀Cu₁₀ alloys under different undercoolings were studied systematically by means of melt coating and cyclic superheating. In the obtained undercooling range, the solidification structures of the two undercooled alloys have similar transformation processes, and there are two kinds of grain refinement structures under the conditions of low undercooling and high undercooling, respectively. The microstructures of the two grain refinement processes were analyzed in more detail by electronic backscattering diffraction technique. Under the condition of small undercooling, dendrite remelting is considered to be the main reason of grain refinement. However, under the condition of high undercooling, the existence of annealing twins and obvious migration of grain boundary are important evidences for the occurrence of recrystallization process.