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深过冷液态金属的凝固特点

魏炳波, 杨根仓, 周尧和

西北工业大学

SOLIDIFICATION OF HIGHLY UNDERCOOLED METALLIC MELTS

Wei Bingbo, Yang Gencang, Zhou Yaohe

Northwestern Polytechnical University

摘要

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摘要 本文评述了近年来深过冷液态金属凝固过程研究的新进展, 论及深过冷获得技术、晶体形核与快速长大、凝固组织形态转变、界面绝对稳定性与无偏析凝固、以及准晶和非晶形成。

关键词: 深过冷 快速凝固 液态金属

Abstract: The undercooling of liquid metals and alloys provides an effective approach to rapid solidification. Usually the crystallization rate increases with undercooling, but crystallization can be thoroughly suppressed if undercooling is sufficiently large and quasicrystals or metallic glasses are consequently formed. The crystallization process of an undercooled melt involves two periods: an initial rapid solidification period accompanying recalescence and a slow solidification period after recalescence which is controlled by external heat extraction. Only when the melt is undercooled to the hypercooling regime can it be wholly rapidly solidified. Competitive nucleation of stable and metastable phases, "dendrite-spherical crystal" transition, "regular eutectic-anomalous eutectic" transition, solid/liquid interface absolute stability, and segregationless solidification are characteristic of the solidification of highly undercooled metallic melts. Since the realization of large undercooling is not limited by melt volume, it is possible to prepare bulk microcrystalline, quasicrystalline and amorphous alloys.

Keywords: undercooling rapid solidification liquid metals

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