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超高压凝固条件下Mg-6Zn-3Y合金的晶体形态及相演变

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**摘要:** 利用扫描电镜(SEM)并配合能谱(EDS)分析研究了超高压凝固Mg-6Zn-3Y合金的晶体形态和相演变. 实验结果表明: 随着凝固压力的增大,  $\alpha$ -Mg晶体的形态发生了粗大树枝晶 $\rightarrow$ 超细树枝晶 $\rightarrow$ 胞状晶转变,即晶体的生长方式逐渐由树枝晶生长 $\rightarrow$ 胞状生长过渡.GPa级超高压下凝固极大地提高了Zn在基体中的溶解度,使之成为过饱和固溶体,并随着凝固压力的增大促使Zn的分布趋于均匀化.Mg-6Zn-3Y合金在2 GPa超高压凝固条件下形成了新相Y固溶体,室温组织由4相组成;在6 GPa超高压凝固条件下大量粒状相均匀弥散地分布在基体上, Mg-6Zn-3Y合金的硬度显著提高.

**关键词:** Mg-6Zn-3Y合金 超高压凝固 晶体形态 Y固溶体 粒状相

CRYSTAL MORPHOLOGIES AND THE PHASES IN THE Mg - 6Zn - 3Y ALLOY SOLIDIFIED UNDER SUPER - HIGH PRESSURE

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**Abstract:** The solidification microstructure of Mg - 6Zn - 3Y alloy under super - high pressure was investigated by SEM and EDS. The results show that solidification microstructure of Mg - 6Zn - 3Y alloy under super - high pressure (GPa level) could be evidently refined and was further refined with the increase of solidification pressure. Solubility of Zn in the alloy reached up to 1.64% under 4 GPa pressure which was increased by 44% than that under the atmosphere condition. Y is insoluble in the matrix, which resulted in a new phase riched in Y and granular phases which were dispersed in the matrix. The morphology of crystal changes follow this way: bulky branch crystal $\rightarrow$ superfine branch crystal $\rightarrow$ cellular crystal, and the growth of crystal changed from branch growth to cellular growth.

**Keywords:** Mg - 6Zn - 3Y alloy super - high pressure solidification dendritic crystal cellular crystal phase component

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## 参考文献:

- [1] Qu Y D, Li R D, Yuan X G, Li C X, Xiang Q C. Foundry, 2005; 54: 539
- [2] Kumar M. Physica, 1995; 212B: 391
- [3] ев А И, translated by Zhang J S. Crystallization of Metal and Alloys Under Pressure. Harbin: Harbin University of Technology Press, 1987: 23
- [4] Mi G B, Li P J, He L J. Chin J Nonferrous Met, 2009; 12: 2074
- [5] Ebihara T, Uwatoko Y, Mohri N. J Magn Magn Mater, 2004; 272-276: e83
- [6] Wang Z X, Lu J B, Xi Y J, Fan J W. J Alloys Compd, 2010; 492: 529 
- [7] Yu X F, Zhang G Z, Xiao H J, Pan A S, Jia G L, Gao Y Y. J Mater Res, 2000; 14(suppl): 141
- [8] Zhang G Z, Yu X F, Wang X Y, Jia G L, Gao Y Y. Acta Metall Sin, 1999; 35: 285 [浏览](#)
- [9] 张国志, 于溪凤, 王向阳, 贾光霖, 高允彦. 金属学报, 1999; 35: 285) [浏览](#)
- [10] Yu X F, Zhang G Z, Wang X Y. J Mater Sci, 1999; 34: 4149 
- [11] Li R D, Huang Z P, Bai Y H, Yu H P. Spec Cast Nonferrous Alloys, 2003; (6): 16
- [12] Wu R I, Wide G, Perepezko J H. J Mater Sci Technol, 2001; 301A: 12
- [13] Yao W J, Wang N, Wei B. Mater Sci Eng, 2003; 344A: 10
- [14] Chen Z W, Jiang Y M, Chai Y. Foundry, 2009; 58: 887
- [15] Xu R, Zhao H, Li J, Liu R, Wang W K. Mater Letts, 2006; 60: 783 
- [16] Kaibyshev F M R, Lesuer D R, Nieh T G. Mater Sci Eng, 2003; A342: 169
- [17] Bao Y Q, Yuan C S, Bai Y H, Li R D. Foundry, 2011; 60: 533
- [18] Liu C M, Zhu X R, Zhou H T. Magnesium Alloy Phase Atlas. Changsha: Central South University Press, 2007: 334
- [19] Zhou H T, Zhang Z D, Liu C M, Wang Q W. Mater Sci Eng, 2007; A445-446: 1
- [20] Yasuo F. J Phys-Condens Mater, 2002; 12: 10727
- [21] Xu R, Zhao H, Li J, Liu R, Wang W K. Mater Lett, 2006; 60: 783 
- [22] Wang Z L. PhD Thesis, Harbin Institute of Technology, 2007
- [23] (王振玲. 哈尔滨工业大学博士学位论文, 2007)
- [24] Li R D, Cao X S, Qu Y D, Xie Y, Li R X, Tian C. Chin J Nonferrous Met, 2009; 19: 1570
- [25] Sun S H, Li J, Xu R, Zhao H L, Liu R P. Chin J High Pressure Phys, 2008; 22: 434
- [26] Wang W K. Chin J High Pressure Phys, 1989; 3: 257
- [27] Yasuo F. J Phys Condensed Matter, 2002; 12: 10727

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2. 刘林;傅恒志.Ni 基高温合金中 MC 碳化物生长的理论形貌[J]. 金属学报, 1989,3(5): 396-400
3. 姜锡山;宫延生;张贵昌.铸钢中(Mn,Fe)S单晶生长形态的研究[J]. 金属学报, 1988,24(4): 295-298