



论文摘要

中国有色金属学报

ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO

第14卷 第11期 (总第68期) 2004年11月

[PDF全文下载] [全文在线阅读]

文章编号: 1004-0609(2004)11-1828-05

氮化铝陶瓷低温烧结过程中的液相迁移与表层晶粒生长

傅仁利¹, 杨克涛¹, 熊党生², 乔梁³, 周和平³(1. 南京航空航天大学 材料科学与技术学院, 南京 210016;
2. 南京理工大学 材料科学与工程系, 南京 210094;
3. 清华大学 新型陶瓷与精细工艺国家重点实验室, 北京 100084)

摘要: 对 YF_3 - CaF_2 烧结助剂体系的氮化铝(AIN)低温烧结过程中液相向表面迁移的现象和表层晶粒生长进行了研究, 同时分析讨论了液相迁移的机制。AIN低温烧结过程中液相向表面的迁移, 有利于减少晶界相, 提高其热导率。然而, 液相向表面过量迁移和富集则导致了表层晶粒的异常生长, 坯体内部由于缺乏液相烧结助剂不能实现致密化, 这一现象也造成陶瓷基板的翘曲。AIN陶瓷坯体在烧结起始阶段的快速收缩和坯体内部AIN晶界两面角大于 72.5° 都有助于液相向表面迁移。低温烧结后陶瓷表面的主要物相是AIN和 Y_2O_3 , Y_2O_3 的出现并被碳热还原生成可挥发的YN可能是表面呈现蓝紫色的原因。表面 Y_2O_3 的产生与钇铝酸盐($Y_3Al_5O_{12}$, $Y_4Al_2O_9$)液相迁移至AIN陶瓷表面并与炉中碳气氛发生碳热还原有关。

关键词: 低温烧结; 液相迁移; 晶粒生长; 氮化铝

Migration of liquid phase and grain growth in low temperature sintering of AlN

FU Ren-li¹, YANG Ke-tao¹, XIONG Dang-sheng²,
QIAO Liang³, ZHOU He-ping³(1. College of Materials Science and Engineering,
Nanjing University of Aeronautics and Astronautics,
Nanjing 210016, China;
2. Department of Materials Science and Engineering,
Nanjing University of Science and Technology,
Nanjing 210094, China;
3. State Key Laboratory of New Ceramics and Fine Processing,
Tsinghua University, Beijing 100084, China)

Abstract: The formation and the migration of the liquid phase towards the surface of AlN ceramics produced via low-temperature sintering of mixture of AlN, YF_3 and CaF_2 powders, as well as the mechanism and the effects of this phenomenon in the final products were experimentally investigated. The liquid phase migrates towards the surface and solidified at the grain boundaries during cooling. Therefore, dense surface and porous bulk microstructure are obtained, which causes warping effect. The rapid shrinkage occurs at the beginning of sintering and the poor wetting of the liquid at the grain boundaries as long as the dihedral groove angle is over 72.5° favor migration. The main phases at the surface are AlN and Y_2O_3 , causing bluish coloring of the surface. However, Y_2O_3 probably resulted from carbothermal secondary reaction of yttrium aluminates ($Y_3Al_5O_{12}$, $Y_4Al_2O_9$) migrates at the surface of AlN with carbon from the graphite-heating element under nitrogen atmosphere.

Key words: low-temperature sintering; liquid phase migration; grain growth; AlN

版权所有: 《中国有色金属学报》编辑部 湘ICP备09001153号

地址: 湖南省长沙市岳麓山中南大学内 邮编: 410083

电话: 0731-8876765, 8877197, 8830410 传真: 0731-8877197

电子邮箱: f-ysxb@mail.csu.edu.cn