E-3

Er_2O_3-AlN을 소결조제로 사용한 질화규소 세라믹스의 기계적 특성

Mechanical Properties of Silicon Nitride with Sintering Aids of Er_2O_3 and AlN

김영미,* 박동수, 김해두, 한병동, 박 찬*
한국기계연구원 세라믹 재료그룹
*부경대학교 재료공학과

본 연구에서는 질화규소의 소결조제로써 8.3 wt% Er_2O_3와 1 9 wt% AlN을 첨가한 β-Si_3N_4 whisker seeds 첨가 질화규소를 제조하고 그 특성을 조사하였다 β-Si_3N_4 whisker의 일방향 배향을 위해 tape casting법을 이용하였고, whisker가 배향된 세라믹 sheet로 적층체를 만든 후 1875°C에서 300 psi의 질소 압력하에 4시간동안 가스압소결하여 소결체를 제작하였다.

β-Si_3N_4 whisker 첨가량은 0, 3, 5 wt%로 하였으며, 각각의 시편을 상온과 고온(1400°C)에서 3점 꺾임강도를 측정하여 기계적 물성을 평가하였다 또한 XRD, 주사전자현미경을 통해 조대주상정들의 배향성과 미세구조 등을 관찰하였다.

E-4

Surface Roughening Transition of NbC Grains in Liquid Co-rich Matrix and its Effect on the Coarsening of NbC Grains

Young Kyu Cho and Duk Yong Yoon
Department of materials Science and Engineering, Korea Advanced Institute of Science and Technology, Daejeon, Korea

The effect of temperature on interface structures, grain shapes, and grain growth of NbC particles dispersed in Co-rich liquid matrix has been studied. When an NbC-30 wt%Co powder compact is sintered at various temperatures where NbC grains (with small amounts of Co) coexist with liquid Co-NbC matrices, the NbC grains undergo surface roughening transition with temperature increase and the grain growth changes from abnormal to normal growth When sintered at 1400°C, the grains are polyhedral with sharp edges (and corners) and grow abnormally because their singular surfaces move by nucleation of surface steps When sintered at 1600°C, the edges become round indicating the surface roughening transition The grains still grow abnormally, but their number density is larger than that at 1400°C because of the expected smaller step free energy When sintered at 1820°C, the grains are nearly spherical, but the flat surface segments still remain The grain growth at this temperature is nearly normal probably because of very small step free energy. The surface roughening transition is reversed when a specimen initially sintered at 1820°C is heat-treated again at 1400°C, but some grains show apparently transition shapes with nearly flat edges and slope discontinuities (shocks). This work has shown that in this alloy with co-existing solid and liquid phases, the grain surface undergoes gradual roughening transition with temperature similarly to the infinite order transition predicted by the solid-on-solid model for free surface and the grain growth can resemble abnormal growth or normal growth depending on the magnitude of the step free energy, which is indicated by the linear dimension of the singular segment