Structural Homogeneity of CIP-ed Compacts of Silicon Carbide and the Influence on Mechanical Properties of Sintered Bodies

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Structural homogeneity of cold isostatically pressed (CIP-ed) compacts of silicon carbide have been characterized by density and microhardness distribution across the cross section of cylindrical compacts. At low applying pressure, a low-density compact with a microhardness distribution shelving down toward the center was obtained. With an increase in applying pressure, the average density increased along with the increase in the microhardness gradient near the surface. As the result, at high applying pressure, the compact showed a shelled structure consisted of a homogeneous inner compact and a high-microhardness outer shell. The inhomogeneity was induced by the difference in pressure dependence of density at low and high pressure range.

The structural inhomogeneity of compacts was inherited in the sintered bodies, and resulted in the degradation of the Weibull modulus. By removing the thin shell of the compacts prepared by high-pressure CIP-ing, the Weibull modulus of sintered bodies was remarkably improved, in contrast to the non-effective contribution of the removal to the low-pressure CIP-ed compact. These results were discussed in relation to the pore growth behavior during sintering.

This is a review of three papers published in J. Ceram. Soc. Japan with additional discussion.