

The role of plasticity as a limiting factor in the compressive failure of high strength ceramics

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Abstract

The behavior of aluminum oxide under compressive loading is investigated over a wide range in strain rate and degrees of confinement. It is shown that plastic flow can be generated in Al_2O_3 at all strain rates if confinement is sufficient to prevent premature failure via microfracture. Moreover, plastic flow is itself a source of microfracture, and the threshold for multiple slip apparently constitutes the practical ultimate strength for the ceramic. Thus, for sufficiently fine-grained alumina tested under optimum conditions, no confinement is required to generate plastic flow, at which stress the material fails via dislocation-induced general microfracture.