

HARDENING EFFECT OF METAL NANOPARTICLES IN CERAMIC-MATRIX COMPOSITES

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The design of new materials with hardness comparable to diamond is an ongoing challenge for scientists and engineers. In the present investigation, enhanced values of hardness have been found in different ceramic-matrix composites reinforced with metal nanoparticles. The hardness increase has been justified by a novel model which takes into account the *Hall-Petch* effect and the mean particle size according to the Percolation theory. It has been found that this model can be successfully applied to different superhard composites. As the obtained densified composites show improved mechanical properties, they can be proposed as alternative materials for cutting and shaping tools, as well as for bearings and other typical applications of high performance materials. The results obtained clearly point out that ceramic-matrix composites reinforced with metal nanoparticles can favourably compete with covalent diamond-like materials in both cost and wear performance.