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Preparation of New WC-Co/TiC-Al_2O_3 Composite Materials with Mechanically Coated Particles

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Mechanically coated particles may constitute a suitable starting point in the preparation of new composite materials. The properties of the sintered materials will depend on the degree of dispersion of the constituent particles throughout the formed material block. A highly uniform particle mixture can be obtained from mechanical mixing or coating of core particles with fine ones.

In this paper, cobalt, aluminum oxide and titanium carbide were used as fine particles to coat coarse tungsten carbide particles together with a binder of Carnauba wax by high-speed rotational impact blending. Uniformity of each component in both mixtures of the coated particles and the sintered composite materials was defined as the degree of mixing from the coefficient of variation of X-ray intensities measured by means of electron probe micro analyzer. Then, the degree of mixing was compared with that of the ordinary mixture prepared with a ball mill. Their differences were correlated with mechanical properties of sintered materials such as transverse rupture strength, Young's modulus, hardness and fracture toughness.

As a result, it was proved that the degree of mixing by high-speed rotational impact blending was higher than that by ball mill mixing at the same initial mixing ratio due to higher level of mechanical impact and shearing forces, and that the mechanical properties by the former method were superior to those by the ordinary latter one.