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Determination of the mechanical properties of carbide composites by spherical instrumented indentation

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Carbide composites are materials based on the carbide phases of the refractory or high melting temperature metals, like tungsten, titanium, tantalum, niobium and etc. The hard carbide phase (WC, TiC) is usually embedded into soft matrix – pure metals (Fe, Co, Mo, Ni and others) or their combinations. The hard phase supports high hardness and strength of the carbide composites, while matrix is needed for toughness and plastic properties. Carbide composites are used as the wear resistant and tool materials in machining, stamping and other applications.

Mechanical properties of carbide composites are conventionally determined by specific techniques if compared with steels and even hard tool steels. The ordinary tensile testing is not applicable for yield stress determination in case of carbide composites. The straining of carbide composites during tensile testing is very low. Conventionally the RTZ (transverse rupture strength or flexural strength) is used to determine strength characteristic of the carbide composites. The yield strength is not usually determined by this testing. The spherical indentation technique was used to determine yield stress of hard materials (carbide composites).

The present work is concentrated on the determination of the yield stress of the WC-Co and TiC-Fe/Ni carbide composites by spherical instrumented indentation. The results obtained by spherical indentation depth sensing testing are in good agreement with previously published results for some hard metals.

Biography

Fjodor Sergejev has completed his Ph.D at the age of 29 years from Tallinn University of Technology. He is an associate professor in Department of Materials Engineering at Faculty of Mechanical Engineering, Tallinn University of Technology. He has published more than 45 articles in peer-reviewed journals and conference proceedings. F. Sergejev is active in the fields of fracture mechanics and fatigue of carbide composites.

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