



# ***Book of Abstracts***

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## **Nanostructured materials compacted via hot pressing method by direct current transmission**

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Nanostructured ceramics have unique properties and performance characteristics due to the formation of a fundamentally different structure compared to their large-crystal counterparts. The most important stage in the technology of nanoceramics production is the formation of quality pressings (compacts) of a given shape made of ceramic nanopowders. NPs of ceramic compositions (often very complex) have a metastable structural-phase state, a developed specific surface and as a consequence, high surface activity and tendency to agglomerate. Pre-prepared tungsten carbide tablets were hot-pressed in a vacuum of 10-2 mmHg. Maximum pressure for graphite PG-7 is about 50 MPa at a temperature higher than 1200°C, so the maximum force for the given mould with a punch d=20 mm is 45 MPa. Temperature of termination of shrinkage has made 1700°C. The density of pressings after grinding was determined by hydrostatic weighing. Rockwell HRA hardness was determined by indenting a diamond pyramid on the TM-12. During high-temperature sintering under load the WC grain size increased insignificantly, remaining mostly less than 1 µm. At the same time there is practically no porosity in the materials. That is why high values of  $\sigma_{vzr} = 720$  MPa were obtained. In our case, a high value of fracture toughness  $K_{Ic}$ , which is important for cutting tool ceramics, can also be expected with a high value of HRA. The increase of fracture toughness of such material can be explained on the basis of the known model of increase of  $K_{Ic}$  in polycrystalline materials, namely by the joint action of two factors: highly dispersed grains and low strength boundaries both between grains below 1 µm and between coarser ones. To conclude, the method of hot pressing under direct current flow makes it possible to obtain high-density nanoporous tungsten carbide products with high physical and mechanical properties.

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