

ADVANTAGES OF THE METHOD OF HIGH-VOLTAGE CONSOLIDATION OF POWDER MATERIALS

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The main features of high-voltage electropulse consolidation (H-VEC) of powder materials and the unique possibilities of the method caused by them are considered. The electro-thermal processes in the H-VEC at the contacts between the powder particles and in the macroscale of the whole consolidated sample are analyzed. The results of calculations of the dynamics of closure (collapse) of interparticle pores in the consolidated material are presented. The experimental results of high voltage consolidation W-based heavy alloys are discussed and a theoretical analysis of the kinetics of compaction of powder materials is made. The results of investigation of the macro- and microstructure of consolidated materials and the stress - strain testing are presented. Compression testing showed that all tested alloys bear compressive stress at room temperature without failure. Figure 1 shows a characteristic diagram of the compressive deformation, which indicates the appearance and development of plastic deformation at the stress above 1250 MPa.

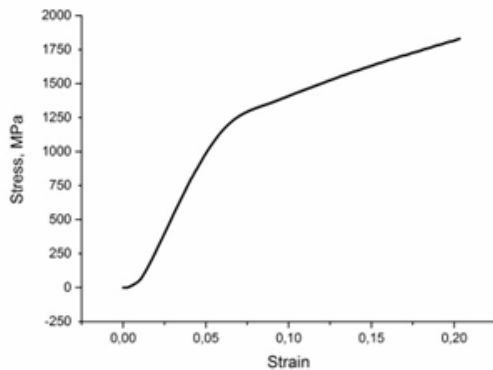


Figure 1 - Deformation curve of the heavy alloy

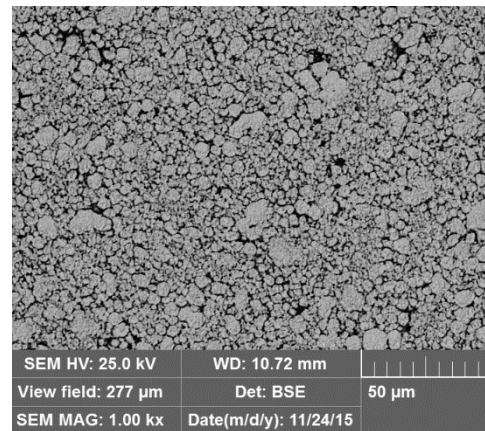


Figure 2 - Microstructure of the heavy alloy

The plasticity of the heavy tungsten alloy is one of the objectives of the current research. Microstructure of the sample obtained by a scanning electron microscope is shown in Figure 2. The high-voltage consolidation contributes to maintaining a initial fine-grained structure, more uniform distribution of iron-nickel binder and almost total absence of porosity.

The optimal modes of high voltage consolidation W-based heavy alloys on the results of tests of short cylinders according to the "Brazilian test" scheme were obtained.

Examples of the use of H-VEK and the direction of further research are considered.