

INFLUENCE OF ADDITIVES ON SINTERING OF POWDER COMPACTS OF PARTIALLY STABILIZED ZIRCONIUM DIOXIDE*

S.A. GHYNGAZOV, E.N. LYSENKO, A.P. SURZHNIKOV, I.P. VASILIEV

National Research Tomsk Polytechnic University, Tomsk, Russia

The study of powder sintering at low pressing densities up to bulk density is important for the manufacture of ceramic products by 3D printing. In this regard, a special role should be given to the use of the technique of doping powders with various fusible additives, which facilitate the process of interparticle interaction during heating. It is assumed that the role of additives will be extremely important in the development of 3D printing by radiation-thermal heating, in particular, by an electron beam [1]. To develop technological methods for sintering powders at bulk density, it is important to study the effect of additives and pressing pressure on the sintering of powder compacts.

The paper considers the influence of additives in the amount of not more than 5% on the processes of compaction of powdered ceramic masses during compaction by the method of uniaxial pressing at various pressures and subsequent sintering in a resistance furnace. The starting materials were powders of partially stabilized zirconia obtained by the sol-gel method (TOSOH, Japan) and by the plasma-chemical method (Siberian Chemical Plant). Polyvinyl alcohol, bismuth oxide, carbon were used as additives. A study was made of the influence of the type (Fig. 1), additive concentration (Fig. 2) and pressing pressure on the characteristics of sintered ceramics. It has been established that small amounts of additives do not worsen the properties of sintered ceramics, and sometimes even improve them.

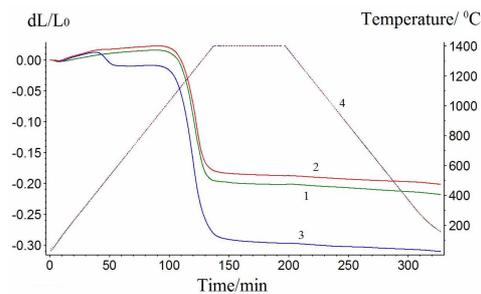


Fig.1. Influence of carbon concentration on densification of zirconium ceramics. 1 - no additive. 2 - 1% carbon. 3 - 5% carbon. 4 - temperature program.

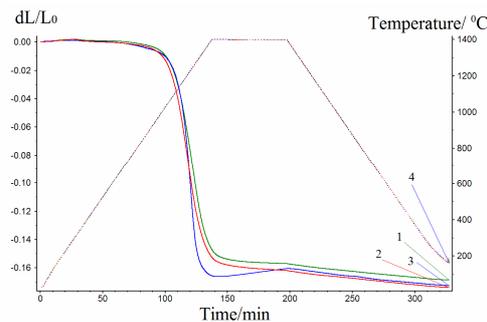


Fig.2. Influence of additive type on densification of zirconium ceramics. 1 - without additive. 2 - addition of 1% PVA. 3 - addition of bismuth oxide 1%. 4 - temperature program.

The report also presents the results of a study of the mechanical properties of ceramics with and without additives.

REFERENCES

- [1] V.K.V. Pasagada, N.Yang and C. Xu, "Electron beam sintering (EBS) process for Ultra-High Temperature Ceramics (UHTCs) and the comparison with traditional UHTC sintering and metal Electron Beam Melting (EBM) processes," *Ceramics International*, vol. 48(7), P. 10174-10186, 2022.

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