EFFECT OF INTENSIFYING ADDITIVES ON THE PROPERTIES OF CELSIAN CERAMICS

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INTRODUCTION

The creation of radio-transparent ceramic materials with a set of high performance characteristics is currently an urgent need for modern aviation and rocket and space industries. Modern technologies make it possible to obtain materials with different properties by modifying them with different additives.

TECHNOLOGY

Technical raw materials: alumina, quartz and barium carbonate. The oxides SnO_2, Li_2O and Cr_2O_3 .

Two-stage ceramic technology:

the first stage - the synthesis of the Celsian phase at a temperature of 1200, 1250 and 1300 °C for 1 hour exposure;

the second - casting the slip into gypsum molds, drying blanks and firing products at a temperature of 1350 °C for 1 hour exposure.

Preparation of the output components of the furnace feed (batch)			
technical alumina	quartz sand	barium carbonate	intensifying additive
dosage	Dosage	dosage	dosage
Grinding (ball mill, until completely passed through the sieve № 0063)			
Moisturizing the press powder with a solution of CCG (W=8%)			
Briquetting (semi - dry pressing, 20 MPa)			
Drying (drying oven, 110°C , 3 hours)			
Firing (muffle furnace, 1,200°C, 1 hours)			
Grinding (< 3 mm)			
Grinding (planetary mill, 20 min.) (<0.1mm)			
Preparation of slip (ball mill+PAR)			
Casting of blanks			
Drying (drying oven, 110°C , 3 hours)			
Firing (silite furnace, 1,350°C , 1 hours)			

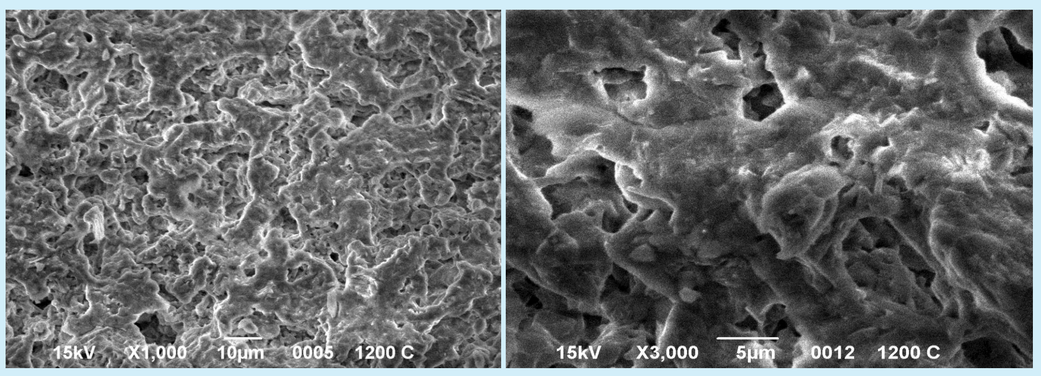
Technological scheme of manufacturing products based on Celsian ceramics

THE AIM

The purpose of this study is to find the optimal additive and its amount for obtaining densely sintered ceramic materials based on celsian at a low firing temperature.

RESULTS

The results of studying the microstructure of test samples obtained at a temperature of 1,200°C, containing the eutectic additive Li_2O – SnO_2 (1 wt.%), indicate the presence of monoclinic Celsian crystals evenly distributed in the glass phase and single closed pores up to 40 μm in size, the presence of which is explained by the accelerated mode firing with a short interval of isothermal exposure. A positive effect of the addition of SnO_2 – Li_2O on the low-temperature activation of the process of synthesizing the Celsian phase and obtaining a densely sintered ceramic material has been established.



Microstructure of samples of Celsian ceramics firing at temperature of 1,200°C at increase of : a) 1,000 times ; b) 3,000 times

CONCLUSIONS:

It has been established that, in terms of its dielectric properties, the obtained ceramic material belongs to radio-transparent materials. Celsian ceramics synthesized at a low temperature of 1,200° C with an exposure of 1 hour and with the addition of 1 wt. % SnO_2 – Li_2O, is characterized by the following properties: water absorption – 7.1%, apparent density – 2.6 g/cm^3, dielectric permittivity – 8.7, dielectric loss tangent – 0.09.