STUDYING ELECTRO-PHYSICAL AND MECHANICAL PROPERTIES OF SNO2- SB2O3-C CERAMIC-BASED COMPOSITE MATERIAL

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Abstract

The materials based on tin oxide and antimony oxide are of great interest as they are conductive at high temperatures and possess high corrosion resistance in corrosive environment such as an electrolyte used in the aluminum electrolysis.

In connection with it these tin dioxide-based materials can find wide application as current-carrying anodes in the aluminum production. In this research the **SNO_2- SB_2O_3-C** ceramics electro-physical and physical mechanic properties have been studied.

The material has been synthesized by the following technology: preparing the mixture→ pressing the press-powder with 5% polyvinyl alcohol content → drying → firing. The pressed samples have been dried in a drying chamber at the temperature of 383 K up to the moisture content of 2 – 4 %. Firing has been done in a muffle furnace in the open air at the temperature of 1573 K. Specific electrical resistivity in the range of temperatures from 20 to 1000°C has been measured by a four-contact method. The thermophysical characteristics have been studied by a Netzsch LFA 457 laser flash method. The material phase composition has been controlled by an X-ray analysis at the XRD 6000 analyzer. Its microstructure has been studied at the JEOL JSM-6490 LV and JEOL JSM 7001-F electronic microscopes.

It has been proved that specific electrical resistance of the ceramics of 96%SnO_2 – 2%Sb_2O_3 – 2%MnO_2 – 2%C at the temperatures of 600-700 °C does not practically depend upon the temperature. At the temperature above 700°C the specific electrical resistivity of the material begins to increase disastrously that is caused by carbon oxidation. At the temperatures of 700-1200 °C the specific electrical resistivity of the ceramics becomes the same as a classical semiconductor and practically becomes the same as carbon-free ceramics with the composition of 96%SnO_2 – 2%Sb_2O_3 – 2%MnO_2.

The replacement of MnO_2 by Al_2O_3 in the material studied allows enlarging the temperature range of the material specific electrical resistivity stability up to 1200 °C.