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PHASE DIAGRAM AND DIELECTRIC PROPERTIES OF MATERIALS IN Bi_2O_3-ZnO-Ta_2O_5 SYSTEM

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ABSTRACT

The subsolidus phase diagram of the system Bi_2O_3-ZnO-Ta_2O_5 in the region of the cubic pyrochlore phase has been determined at 1050^oC. This phase forms a solid solution area that includes the ideal composition P, $Bi_3Zn_2Ta_3O_{14}$. Possible solid solution mechanisms for the cubic pyrochlore phase are proposed. Density measurements of Zn deficient solid solutions were carried out in order to determine the possible solid solution formation mechanisms. The general formula of the solid solutions is proposed to be $Bi_{3+y}Zn_{2-x}Ta_{3-y}O_{14-x-y}$, based on the mechanisms of Zn/oxide ion vacancies and variable Bi/Ta ratio. Solid solution series at x = 0 and y = 0 were investigated using impedance spectroscopy for their dielectric properties. These materials appeared to be dielectric. $Bi_3Zn_2Ta_3O_{14}$ has ε' of 42 at 30^oC and 1 MHz; ε' for the solid solutions range from 39 to 65. A high degree of dispersion on the permittivity at low frequencies (<1 kHz) and temperatures above 600^oC is apparent.

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