# THE INVESTIGATION OF DIELECTRIC PROPERTIES OF MIXED PHOSPHATES OF ALKALINE-EARTH AND TRANSITION 3d-METALS

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The investigation of one group of phosphates was performed as a further contribution to a work started several years ago. These phosphates are of the type

$$AB_2(PO_4)_2$$

where A is a cation of an alkaline-earth element of large radius (for example Ba,Ca) and B is a cation of smal radius, preferably of the transition 3d-elements. So far, have been investigated the phosphates with the following B-cations : Mg,Co,Ni and Zn.

These materials are potentially interesting because of their magnetic ($3d^n$-ions) as well as their dielectric properties|1|. There are only few data on these materials in literature. Some of the phosphates (and arsenates) of the above type are found to have two crystal forms, and the crystal structure of the high temperature modifications|2| is determined. $BaCo_2(AsO_4)_2$ is found to be metamagnetic at very low temperatures|3|.

Our investigations of this group of phosphates includes the problems of crystallization and single crystal growth |4|,as well as the investigation of their physical properties.So far,the investigations have been performed on th

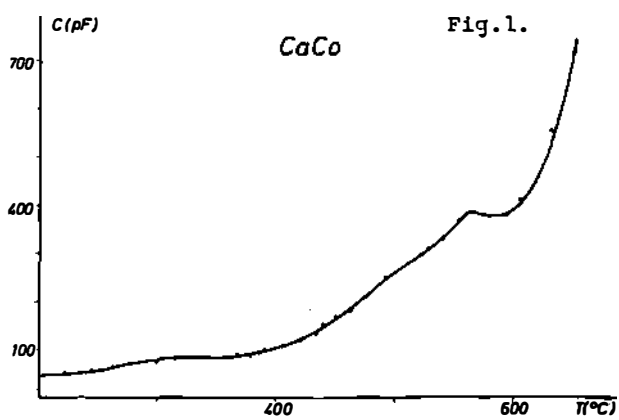

Fig.1.

polycrystalline ceramic samples|5|. In the present paper will be presented the measurement results of:

- dielectric permittivity at the frequency of 800 Hz, and
- electric resistance in the direct current regime.

The measurements included $BaCo_2(PO_4)_2$, $BaNi_2(PO_4)_2$, $BaMg_2(PO_4)_2$, $BaZn_2(PO_4)_2$ and $CaCo_2(PO_4)_2$. The ceramic plates 2 mm thick were used as samples and the measurements were performed in specially designed measuring cells in the temperature range from the ambient temperature to 650°C that is 850°C in respect with the sample investigated. In fig.1. and 2. the dependence of electric resistance on temperature R(T) as well as the dependence of electric capacitance (dielectric permittivity) on the temperature C(T) for $CaCO_2(PO_4)_2$ are presented as an example.

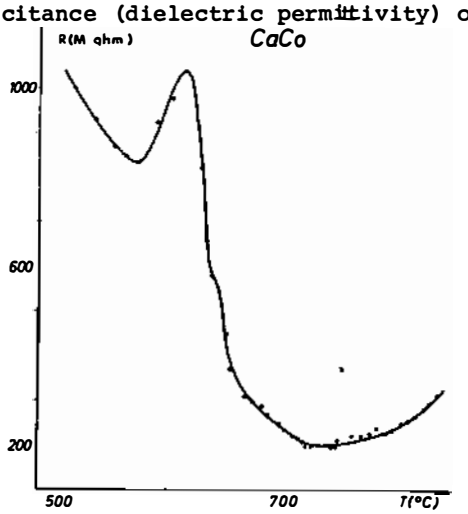


Fig.2.

These measurements have shown that:

a. in the range from about 300°C to 340°C there is a slightly pronounced change in the course of the dependence C(T) and R(T);
b. in the range of about 570° i.e. 660°C there are clearly pronounced changes in the course of the dependence C(T) and R(T); and
c. for $BaZn_2$ - and $BaCo_2$ - phosphates a slight change in the course of dependence C(T) and R(T) at approximately 400°C is observed.

In fig.3. the shematic representation of experimental data (a. and b.) for characteristic temperatures of investigated phosphates is given.

The explanation of the observed changes in behaviour of C(T) and R(T) demands further investigations.With this aim the first x-ray diffraction investigation were performed.So far it seems that the change in crystal structure does not exists at the low characteristic temperatures while the reversible structure change corresponds to the high characteristic temperatures. The R(T) and C(T) measurements show that near these structure phase transitions there is a temperature hysteresis several degrees wide.

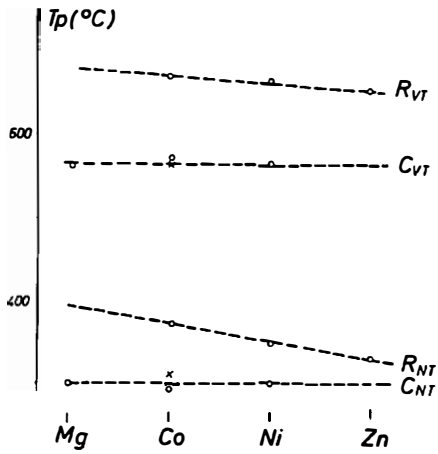

Fig.3.

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