

THE INVESTIGATION OF THE PHYSICAL PROPERTIES OF
CALCIUM-COBALT PHOSPHATE $\text{CaCo}_2(\text{PO}_4)_2$

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The synthesis of phosphate $\text{CaCo}_2(\text{PO}_4)_2$ whose crystal structure and physical properties are not described in literature is carried out. The investigation of the crystallization process of this substance [1] as well as the study of the physical properties of the polycrystalline samples is done simultaneously. Thus, for example, the investigation of the dependence of dielectric permittivity and electrical resistance on temperature [2] was done. The results of investigations carried out by other methods will be presented in this paper :

- The method of reflection spectrophotometry in the range from 3.600 to 10.000 Å, at the ambient temperature; and
- Gouy method for measuring of magnetic susceptibility in the range of temperature from 230K to 340K.

Recording of the reflection spectrum of $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ was done under the same conditions so that the comparison could be made. In this substance Co^{2+} ions are in the regular octahedral surroundings [3]; the reflection spectrum of this substance [3] shows that Co^{2+} ions are in a weak crystal field of electronic configuration $t_{2g}^5 e_g^2$. Our investigation shows that in the spectrum $\text{CaCo}_2(\text{PO}_4)_2$ lines of all transitions that exist in the reference spectrum can be identified.

Measurement of magnetic susceptibility χ shows that in the investigated temperature range $\text{CaCo}_2(\text{PO}_4)_2$ is a paramagnet to which Curie-Weiss Law is valid :

$$\chi = \frac{C}{T - \theta}$$

where $\theta = 120.5\text{K}$ and $C = 13.85 \cdot 10^{-16}\text{K}$ (after the corrections for diamagnetic contribution, [4]). From the value C it follows that the magnetic momentum of Co^{2+} ion has

$$n_{\text{eff}} = 5.17$$

of Bohr magnetons what is near the theoretical value (5.20) for the magnetic momentum of Co^{2+} ion whose orbital angular momentum is not quenched [5]. This result is in full agreement with the theory of crystal field, because there is no quenching of the orbital momentum in a weak crystal field.

Further investigations of this substance one presently being carried out, as for example x-ray diffraction structure determination, as well as the investigation of magnetic and electrical properties at very low temperatures.

References:

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