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Photo- and X-ray sorption properties of magnesium fluoride

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Magnesium fluoride is widely used in the optical and catalytic industries. In this regard, it is important to study the surface properties of MgF2 and to search new effective photosorbents and photocatalysts. The purpose of this work was to study the photo- and X-ray sorption, photocatalytic properties of magnesium fluoride [1].

In this paper powders of magnesium fluoride being of kind "pure for optical ceramics" obtained from basic magnesium carbonate – (MgF_2-1) and samples of kind "pure for thermal pressuring" formed from $MgCl_2$ – (MgF_2-2) have been studied. The neutral surface in connection with acid-basic properties is typical for the samples of (MgF_2-1), while that for (MgF_2-2) is the acid one.

Photo- and X-ray sorption of oxygen nave been examined on the samples mentioned above. Illumination of the samples has been carried out with the help of full light of PRK-lamp. The portative apparatus REIS-I (a tube with copper anode) has been used as a source of X-ray radiation.

The ions of contaminated oxygen as well as F- and M- centers are considered to be possible centers of photostimulated oxygen adsorption on the samples studied. It has been suggested that high temperature forms of (560 and 635 K) can be a result of dissociative adsorption of oxygen while low temperature forms (380 and 450 K) can be referred to the molecular forms of O_2^{-t} types [2]. Photosorption capacity of the samples obtained by different ways is similar.

Kinetics of oxygen photosorption for all the samples has a power-law character. Kinetics of oxygen X-ray sorption on magnesium fluoride can be easily described with an equation of "local" kinetics. Spectra of X-ray-sorbed oxygen thermodesorption sharply differ from TD-spectra of oxygen photosorbed on these samples. This fact also confirms the different mechanism of these processes development [3].

As a result of an experimental study of the photocatalytic properties on the surface of magnesium fluoride, the reactions of dark hydrogen oxidation, photooxidation of H_2, CO, and CO_2 photolysis were found [2]. It is proposed a probable mechanism of the hydrogen photooxidation reaction on the basis of the performed kinetic studies. A required stage of the process is oxygen photosorption. In the limiting stage of the reaction, electronically excited states of photosorption oxygen interact with molecular hydrogen in the gas phase and are deactivated by oxygen in the gas phase.

References

[1] T.S. Minakova, *Alkaline-earth metals and magnesium oxides and fluorides. Surface properties* / T. S. Minakova, I. A. Ekimova. – Tomsk: Publishing House of Tomsk State University, 2014. 148 pp.

[2] A.V. Rudakova Physico chemistry of alkaline earth and magnesium fluorides surfaces and photostimulated processes which occur on them: dis…candidate of chemical science /A.V. Rudakova – Tomsk, 1999. 142 pp.

[3] E.P. Meshcheryakov Sorption and X-ray stimulated processes on alkaline earth metals and magnesium fluorides: dis…candidate of chemical science./ E.P.Meshcheryakov – Tomsk, 1995. 155 pp.