RADIATION EFFECTS ON OXIDE MATERIAL SURFACE

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We investigated the influence of ultra-violet and gamma as well as neutrons and charged particles on the surface qualities of different oxide systems: oxides of silicon, beryllium, aluminum and others, in particular their absorbent qualities.

In the present work the analysis of the previous works has been carried out and suppositions concerning the reasons of radiation effects observed in the experiments have been given.

The influence of irradiation on surface properties of silicon, beryllium aluminum and others oxide were investigated by manometric and ESR-spectroscopic methods.

As for mechanism of oxygen adsorption on oxides it is possible to make the following supposition: the surface of oxides covered with hydroxyl groups and at irradiation they can be failed. Thus on a surface the active centers are created, which are capable to become by centers of adsorption. Besides the irradiation is capable to destroy an organic located in adsorbent volume and to generate diffusion of organic debris to a surface, which one entering in connection with an adsorbed gas molecule, can form new organic compounds, and by that veil process of radiation adsorption.

At irradiation of oxides the paramagnetic centers are formed, which have a complicated structure. The signals ESR on oxides, irradiated by protons and gamma rays , apparently, are formed both on a surface and in volume, as from the one hand at adsorption of oxygen there is decreasing (or increasing) of a signal amplitude (destruction of surface ESR centers), and on the other hand even flooding of free air does not completely destroy signals of ESR (volumetric ESR centers). The form of the signal at an adsorption of oxygen in comparison with vacuum-processes samples does not change.

The paramagnetic centers, observed by us, are the sum of volumetric centers on a surface of paramagnetic centers. The accumulation curve of paramagnetic centers on a surface BeO with adsorbed oxygen lies above by accumulation curve of paramagnetic centers of vacuum-processed BeO, since the adsorption of oxygen on BeO increases quantity of paramagnetic centers, i.e. the oxygen is adsorbed in the ion - radical form O2-, as was watched in our experiments except for small doses ($F<1\cdot10^{14}cm^{-2}$). Since a fluence $F=2{,}25\cdot10^{14}cm^{-2}$ the number of paramagnetic centers in a system BeO-O2 is more than in vacuum-processed one.

Various different kind of radiation influence on surface properties, in particular, adsorptive, was revealed and at some cases the general observation regularity of the radiation adsorption is upset. So, the hydrogen photoadsorption is not observed on silicon dioxide and on some other oxides. At the same time hydrogen adsorption takes place at the same oxides irradiation by more power nuclear particles, such as gamma - rays, protons of high energies, alpha-particles, neutrons, high-velocity electrons, and also at a X-irradiation.

At the same time oxygen adsorption takes place on the majority of the studied oxides. So it is possible to conclude that at the irradiated adsorbents the formation of electronic centers is general regularity. The radiation adsorption of oxygen is well studied on many systems and its regularities are established on numerous experiments.