

## The Energy Distribution Changes Of the Valence Electrons of Mixtures $x\text{-SiO}_2 + y\text{-}\gamma\text{-Fe}_2\text{O}_3$ Before and After Mechanical Activation

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Properties of such materials in nano-composites are reciprocally supplemented. Thus, it is important to investigate an electronic structure depending on composition of such nanomaterials and synthesis method. Therefore, it is necessary to study the effect of method mechanical activation on the energy distribution of the valence electrons and charge state of constituent atoms after treatment of iron oxide and silica mixed in different ratios.

Crystalline and electronic structures of  $x\text{-SiO}_2+y\text{-}\gamma\text{-Fe}_2\text{O}_3$  mixtures have been analyzed using X-ray diffraction and ultra-soft X-ray emission spectroscopy. The energy redistribution of  $Fespd$ -,  $Sisp$ - and  $Op$ -valence electrons due to changes of mass ratio (20/80, 50/50, 80/20) of  $\text{SiO}_2$  and  $\alpha\text{-Fe}_2\text{O}_3$  initial precursors in mixtures has been studied. The  $FeL_{\alpha^-}$ ,  $SiL_{\alpha^-}$ (Fig. 1 (2)) and  $OK_{\alpha^-}$ (Fig. 1(1)) ultra-soft X-ray emission spectra of  $\text{SiO}_2/\alpha\text{-Fe}_2\text{O}_3$  mixtures were compared with those of iron oxide and silica powders. During analysis of these bands was detected shape similarity and availability of identical elements of fine structure in  $OK_{\alpha}$  and  $FeL_{\alpha}$ -emission spectra, which indicate about high degree of hybridization  $Op$ - and  $Fe3d$  - valence states of electrons. Expansion  $OK_{\alpha}$  and  $FeL_{\alpha}$ -emission bands in low energy side is the result of additional splitting energy  $Op$ - and  $Fe3d$  - levels with increasing degree of hybridization in the mechanical activation processing.

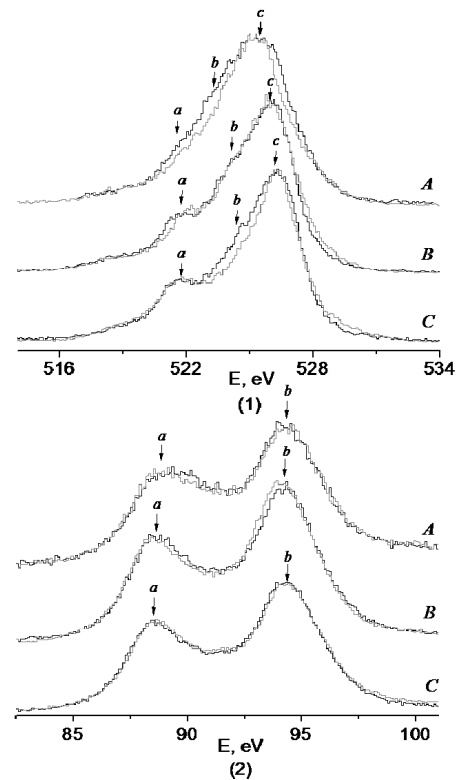


Fig. 1. Displacement of contour of the  $OK_{\alpha^-}$ -(1) and  $SiL_{\alpha^-}$ -(2) bands after mechanical activation: a) 0,2 /0,8, b) 0,5/0,5, c) 0,8/0,2. Grey lines correspond to the bands of mechanical mixture. Black lines represent the bands of mechanically.