

The Synthesis and Physicochemical Investigations of Peroxide Layered Structures as Possible Long-Lived Drug Substances.

E.Ippolitov, T.Tripol'skaya, I.Pokhabova, G.Pilipenko, P.Prikhodchenko

Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences.
Moscow, Russia, e-mail: tatri@igic.ras.ru

In studies of peroxide complexes of nontransition elements we have shown that hydroxide ligands in the coordination sphere of a complexing element can be replaced by hydroperoxide ligands in strong hydrogen peroxide solutions. It was developed the efficient method for obtaining stable peroxide complexes of some nontransition metals (e.g., B, Al, Sn, Sb and In). In this work, this approach was applied to the synthesis of layered double hydroxides (LDH) and their modified analogs with hydrogen peroxide. It is known, that the LDH are the host-guest compounds with composition: $M^{2+}_{1-\delta}M^{3+}_{\delta}[(OH)_2(An^{n-})_{x/n} \cdot mH_2O]$, where M^{2+} - Mg, Zn, Fe, Co, Ni; M^{3+} - Al, Fe, Ga, In and others. These compounds have found many practical applications including medicine. For example, Al-Mg-LDH are used in drugs with acid-neutralizing action like Almagel (Pharmachim Holding) and Maalox (Rhône-Poulenc Rorer).

The recent investigations of the Li-Al LDH structure by powder neutron diffraction and NMR have shown that this structure can be described as $[M^{2+}_{1-\delta}M^{3+}_{\delta}(OH)_6]^+$ layers alternating with layers of OH^- anions and water molecules.

For realization of our purposes we used the structure peculiarities of a layered matrixes, which suggest at least three types of fixation of peroxides:

1. Intercalation of peroxide molecules into the interlayers.
2. Substitution of (OOH^-) groups localized in the interlayers of the initial structure for (OH^-) groups.
3. Substitution of H_2O_2 molecules for H_2O molecules, or addition of peroxide molecules to water molecules.

We have developed methods for the synthesis of stable peroxide-containing host-guest systems. A heterophase ion-exchange reaction between solid Mg-Al, Zn-Al LDH, their modified analogs and hydrogen peroxide in aqueous solution and in the gaseous phase produced peroxo intercalation compounds containing up to 21 wt% of active oxygen. The reaction products were characterized by X-ray diffraction measurements, thermal analysis, Raman spectroscopy and ^{27}Al NMR. Based on our study, we proposed a tentative model of the intercalation of the LDH structure with hydrogen peroxide.

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Reference

1. E.G.Ippolitov, T.A.Tripol'skaya, G.P.Pilipenko //Zhurn.Neorgan.Khimii, 1998,V.43,N3,p.370-374
2. E.G.Ippolitov, T.A.Tripol'skaya, P.V.Prikhodchenko, D.A.Pankratov //Zhurn.Neorgan.Khimii, 2001,V.46,N6,p.946-952
3. V.P.Isupov, L.E.Chupakhina, S.G.Kozlova, S.P.Gabuda // Proc.of VI-th European Conf. of Solid State Chemistry, Zurich-1997, V.2, PB83