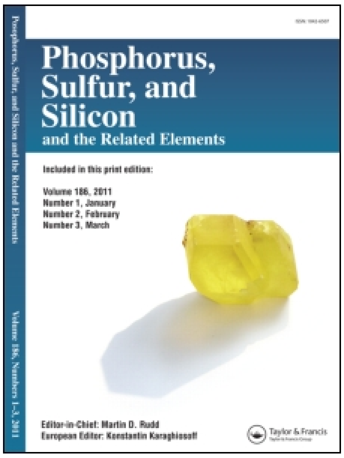

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Interactions and Analysis of Diethyl-S (Ethyl-Thiomethyl)-Phosphorothiolothionate

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INTERACTIONS AND ANALYSIS OF DIETHYL-S(ETHYL-THIOMETHYL)-PHOSPHOROTHIOLOTHIONATE

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Abstract In this paper are presented some of interactions of the diethyl-S-(ethyl-thiomethyl)-phosphorothiolothionate with Fe^{3+} -, Cr^{3+} -, Ni^{2+} - and Zn^{2+} -ions. There were investigated processes of the complexation by means of UV spectrophotometry. Also was followed the differency of concentration of the investigated compound (DEETMPTT), before and after complexation, and adsorption. The cleavage reaction were studied on activated silica -air gel, by means of IR spectrophotometry.

THE STUDY OF INTERACTIONS

The experiments were setted into two groups. The first group of experiments involves exploration of the direct interactions of DEETMPTT and the Me-ions.

In the second group of the experiments the interactions uprried out on the surfaces of different carbon black and on silica based adsorbents. As adsorbents there were used activated carbon black (BDH) and others, prepared from different kernels. The coating of activated carbon black resulted heterogenic charged surfaces, with distributed Me-ions.

The interaction between DEETMPTT and water was studied by means of hydrolysis. The cleavage reactions with specially prepared activated surfaces were obtained. In this reactions the Meions have the function of the reference substances and their reaction were the model reactions.

The deeper study of the hydrolysis and the cleavage reactions leads to the recognition of the mechanism of the degradation of DEETMPTT. For chemical structural analysis were used UV spectrophotometry by B.S. Anderson´s method (1).

For UV spectrophotometric measurements were used ethanolic solutions of the DEETMPTT 1.7×10^{-2} mol/dm^3.

The concentration calculations were done for absorbance at $\lambda_{max} = 218$ nm.

From the UV spectras could be concluded, that the adsorbtion of the DEETMPTT on activated carbon black as well as on the activated silica is time dependent.

The UV spectras which shaw the interaction of Me-ions, have characteristic shapes with two absorbtion maximums at 218 nm and 248 nm. The UV spectras of DEETMPTT interaction with Cu^{2+} -ions, in ethanolic solution are characteristic with a strong batochromic effect of the second absorbtion maximum and appears at 262 nm.

The interaction of DEETMPTT with potassium hydroxide, was investigated by means of UV spectrophotometry and there was confirmed the time dependent hydrolysis, followed with degradation of the organic phosphorothiolothionate.

The reaction of the degradation was investigated also by means of UV spectrophotometry combined with GC and TLC technique. The hydrolysis products, the ethyl phosphate and the diethyl phosphate were identified on the thinlayer of silicagel-G.

The degradation of the DEETMPTT with potassium hydoxide was improved when the reaction was carried out on the coated surface of the activated carbon black.

The cleavage reaction of the organic phophorothiolothionate molecule was carried out on the activated surface of prepared silicagel and on the surfaces of different activated carbon. The adsorbtion data are also reported.

Structural study of the investigated organic phosphorothiolothionate in the sorbtion processes carried out by means of IR spectrophotometry, having some of experiences with other species. Some of structural studies on the base of IR spectras, on the activated surfaces of adsorbents, has ben noticed before in the literature (2,3,4,5,6).

The IR spectras of the hydroxyl groups on the surface of activated silicagel were studied by B.A.Morrow and I.A.Cody (7), the adsorbtion of molecular water by L.A.Ignateva (8) and also the changes in the intensities of IR band due to the adsorbed species or bulk material by R.L.Goldsmith (9).

In our investigation were studied also the hydroxyl-groups, the molecular water, hydrogen bonds and the bonds formed between the surface of the activated silicagel and the DEETMPTT, by means of quantitative differential IR spectras, distinguished.

On the activated silica´s surface, the interaction of the DEETMPTT, could be characterized by means of IR spectras with half bond width and band position. In IR spectras, the bands due to hydroxyl groups and the hydrogen bond in the thiolothionate alkyl chain appears clear. The broadening of the IR band is indicative to the process of cleavage in the thiolothionate group in the molecule of the DEETMPTT.

For the control of the OH - groups, on the surface of activated silica there were chosen IR absorbtion bands at 3750 cm^{-1}, 3650 cm^{-1}, and 3550 cm^{-1}, before and after the thermal treatment of the silica.

In our experiments all adsorbents were purified, thermally treated, according to the requirements of the powder surfaces, which are used as activated surfaces.

The number of hydroxyl groups were determined as well as the microporosity. The corresponding specific surface areas were determined by the BET method. The concentrations of the investigated DEETMPTT were determined by means of UV spectrophotomethy and gas chromatography reaspectively.

The study of sorbtion processes of the organic phosphorothiolothionate on the activated powder surfaces helps to finde out the mechanism of the degradation and to make some of conclusion about purification of the air, waters from the environment and other systems from the highly toxic phosphorus compounds.

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