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Physico-chemical study of complexing processes in $AlCl_3$-L-H_2O system where L – DPA, centralite, DNT, DBP

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Abstract

This work presents a method of powder components' interaction, containing a trivalent nitrogen and other atoms with an undivided electron pair (UEP) with the aqueous solutions of complexing extragents. In the role of the latter, an aqueous solution of aluminium chloride was studied. Diphenylamine (DPA), centralite 1 (or diethyldiphenylurea), dinitrotoluene (DNT) and dibutylphthalate (DBP) were considered as organic components. A donor-acceptor mechanism of the reagents' interaction is proposed, in which a section of a molecule of an organic component of powder, containing an element atom with UEP, acts as a donor of the electron pair; an aluminium ion with free *p*- and *d*-orbitals acts as an acceptor. It is the presence of both types of free orbitals that allows Al^{3+} ion to increase its coordination up to 6 in complex compounds, which it forms.

The complex compounds (CCs) of aluminium chloride and powder components with the trivalent nitrogen atom and with other atoms with UEP were obtained in an aqueous medium. CCs were studied by the methods of the physico-chemical analysis such as conductance-measuring and titrimetric methods (complexation and agrentometric titration), chromatographic methods (thin-layer chromatography and gas-liquid chromatography) and spectral methods (IR- and UV-spectrometry).

The fragments of functional groups, involving in the formation of the intermolecular bonds such as amino group in DPA molecule, carbonyl group in centralite 1 molecule, nitro group in DNT molecule, ester group in DBP molecule and π-system of aromatic ring in all molecules of the considered organic components of powder, were revealed. It is found that a reason for an increase in a solubility of organic compounds of powder in water is the formation of complex compounds such as "double salts". The optimal conditions for obtaining CCs such as "double salts" were determined. Later, this fact was applied for an extraction of these components from a powder composition.

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