

SYNTHESIS, PROPERTIES AND ASSIMILATION OF ALUMINIUM HYDRIDE

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Chemistry of aluminium hydride is one of the most interesting and perspective from cognitive and practical views of point fields of contemporary chemistry.

Aluminium hydride is very reactive substance, which is at the same time very effective hydrogen-carrier. It is used as hydrogen source, active reducing agent of functional groups of organic compounds. Considerable power intensity causes possibility of utilization of AlH_3 as the component of solid rocket fuel. Aluminium hydride, being carrier of AlH_3 -groups, is used for synthesis of alumohydrides and polyhydride aluminates of metals.

The present work summarizes the research results on synthesis and properties of aluminium hydride.

We have carried out systematic investigation of the interaction of aluminium hydrides of metals of I group and IIA group with electrophilic reagents ($AlCl_3$, HCl , $RHAl$, AlH_3 , $LiAlH_4$, $LiBH_4$). We developed a conception about synthesis mechanism of aluminium hydride as heterolytic splitting process of alumohydride molecule under influence of acceptor effect of electrophilic agent



We discovered possibility of fixation of AlH_4 -groups in the solutions of aluminium in the main reaction of synthesis of AlH_3 via $LiAlH_4$ and AlH_3 . The fixation may be achieved by insertion of soft electrophilic agents, such as haloid alkyls, which allows increasing the effective concentration of AlH_3 and it is perspective for production increase.

We proposed the chlorobenzyl method of synthesis of aluminium hydride, which is perspective for the development of continuous manufacture of the substance. It provides

adherence exclusion and synthesis of chlorine-free product.

We proposed a synthesis method for AlH_3 via calcium hydride and NaH , including intermediate synthesis of calcium alumohydride.

We developed "alan" method of synthesis of hydrogen compounds of aluminium, providing quantitative transformation of the most binary hydrides of sodium and calcium into hydroaluminates $M^n(AlH_4)$ and aluminium hydride.

On the basis of physical and chemical analysis of the systems with participation of binary and complex hydrides and conceptions about heterolytic mechanism of interaction of alumohydrides with electrophilic reagents we have developed perspective for practical utilization:

1. Programmed synthesis of aluminium hydride and alumohydrides according to the reaction of binary hydrides with aluminium chloride during process autointiation;

2. Direct crystallization of aluminium hydride in one phase during its synthesis by interaction of binary hydride with aluminium chloride, which excludes long material-consuming and power-consuming stages of synthesis of alumohydride and solutions (or solid etherate) of aluminium hydride.

We found assimilation methods of AlH_3 in carrying out of solid-phase chemical reactions. Using AlH_3 we synthesized magnetic nickel powders. We found the conditions of influence of AlH_3 on initiation. We studied catalytic properties of AlH_3 during dissection of boron-containing minerals. We determined the contribution of hydrogen atoms in generation of microdefects in crystal lattice and transition of the mineral into its mobile shape.