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The role of non-ionogenic surfactants in formation of porous structure of active aluminium oxide

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Abstract

In this work, regularities in formation of porous structure of active aluminium oxide under conditions of hydrothermal synthesis (HTS) in the presence of non-ionogenic surfactants (NIS), namely of poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) (Pluronic) have been ascertained. Formation of a NIS-based organo-inorganic gel-precursor and of hydroxonic forms of aluminium oxide (precursor forms of aluminium oxide) formed either during precipitation from soluted aluminium salts or as hydrolyzed aluminium alkoxides has been evinced to be the key moment in HTS of active aluminium oxide with bi-modal porous structure. Spatial organization of the organo-inorganic gel-precursor has been ascertained to be determined by interaction between particles of precursor forms of aluminium oxide and NIS which, in turn, is determined by their phase composition. A mechanism to form the NIS-based organo-inorganic gel-precursor and hydroxonic forms of aluminium oxide has been proposed. The influence of type and quantity of NIS on parameters of porous structure of aluminium oxide was ascertained. The structure of aluminium oxide, as hydrophilic-lipophilic balance of NIS increases, was shown to change from the homogeneously porous structure characterized by cone-shaped pores to the structure with bi-modal pore size distribution.