SYNTHESIS AND INVESTIGATION OF CARBON SUPPORTED ADSORPTIVE CATALYSTS FOR PROCESSING OF TOXIC CHLORORGANIC COMPOUNDS

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Intensive exploitation of limited water resource and water pollution makes wastewater treatment and industrial process water re-use of outmost importance. In 80-s' years of 20 century it has been established, that polychlorinated aromatic compounds (PCAC) are very toxic substances. Processing and recycling of these compounds are complicated not only by their thermal and chemical stability, but also by formation of very hazardous pollutants - dioxines. The adsorption technologies developed for waste treatment of the industry do not solve a problem of the further recycling highly toxic PCAC. The analysis of various methods of processing PCAC has shown that the most perspective is the catalytic hydrogenolysis process. The combination of adsorption step and catalytic hydrogenolysis allows to considerably simplify the scheme of processing PCAC, preventing dioxines formation and increasing the durability of the equipment.

The goal of the research work is synthesis of the active and stable adsorptive catalysts, capable to adsorb highly toxic polychlorinated aromatic compounds from objects of an environment for the further processing. During this research work the adsorption step of chlorobenzene (CB) and dichlorobenzene (DCB) from water solutions was studied and it was shown, that the quantity of adsorbed CB and DCB and a kind of adsorption isotherms are in a good accord with porous structure of carbon adsorbents. The most effective CB adsorbents are microporous carbons with the high surface area MeKS, FAS, AG-2000. On the basis of the given carbons, palladium catalysts were synthesized and their activity in liquid-phase hydrodechlorination of CB and DCB by molecular hydrogen was studied. Conditions of the process were optimized.

The hydrodechlorination of chlorobenzene and dichlorobenzene by gaseous hydrogen was carried out at 20 or 50°C in a glass temperature-controlled internal mixing reactor in water or in multiphase reaction medium: organic solvents (2-propanol and toluene) and aqueous solution of KOH. Experimental data shown that hydrodechlorination only in water is not efficient. It may be caused by strong adsorption of CB and DCB in the micropores of support. As a result of the investigation of the prepared adsorptive catalysts in adsorption catalytic cycle, it was shown, that 1 % Pd/AG-2000 specimen possesses high adsorption capacity in relation to CB and DCB and has the highest catalytic activity in multiphase reaction medium under mild conditions (pressure 1 atm and temperature 50 °C). Using of multiphase reaction medium (2-propanol and aqueous solution of KOH) allows achieving complete dechlorination not only for CB and DCB, but also for polychlorinated aromatic compounds as hexachlorobenzene. Obtained results permit to suppose that 2-propanol is not only solvent, but reagent too. In our research work was shown that two steps technology: (1) adsorption of chloroaromatic compounds on adsorptive catalysts from water and (2) hydrogenolysis of chloroaromatic compounds in multiphase system is very efficient for water purification from toxic chlorocontaining pollutants.

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