PHYSICOCHEMICAL PRINCIPLES OF DEVELOPMENT OF LOW-TEMPERATURE CATALYSTS FOR SOLVING ENVIRONMENTAL PROBLEMS: REVIEW

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Abstract. The article presents a concept for the development of low-temperature supported metal complex catalysts based on carriers of various origins for the neutralisation of gaseous toxic substances such as carbon monoxide, phosphine, sulphur dioxide, and ozone, as well as the application of these catalysts in personal respiratory protection equipment for workers in different industrial sectors and for the civilian population in emergency situations. The physicochemical principles for the development of supported metal complex catalysts are based on the recognition that supports are not inert substrates but, through a set of physicochemical properties, significantly influence the composition and activity of surface complexes. For the first time, generalised thermodynamic parameters GTP(I) = lg(a_{H_2O}/a_L) and GTP(II) = lg($a_{H_2O}/(a_{H_3O^+}.a_L)$) were proposed to characterise the influence of the support on surface complex formation processes via changes in the activity of water (a_{H_2O}), hydronium ions ($a_{H_3O^+}$), and ligands (a_L). Systematic approaches were developed for the targeted search for new catalysts using natural resources of Ukraine. A synergistic effect of palladium(II) and copper(II) compounds was revealed not only in carbon monoxide oxidation reactions but also in the oxidation of phosphine and sulphur dioxide, as well as in ozone decomposition. The advantages of the newly developed copper-palladium catalysts compared to hopcalite catalysts were demonstrated.

Keywords: redox reaction, phosphine, carbon monoxide, sulphur dioxide, ozone.