Features of the Gas Chromatographic Method for Monitoring the Content of Phenols in an Aqueous Medium

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Abstract: The study aims to determine the content of phenols in an aqueous medium by gas chromatographic method using various sorption materials. For this purpose, some features of the gas chromatographic method for monitoring the content of phenols in an aqueous medium using various sorption materials are considered. Based on a detailed literature review, it is shown that phenols and their derivatives are highly toxic substances; they have low values of MPC standards, and have a negative impact on the human body, which necessitates their control in the aquatic environment. To determine the content of phenols in an aqueous medium, the experimental part of the work was carried out on a gas-liquid chromatograph Crustallux-4000M with packing columns filled with various physicochemical sorbents. For gas chromatographic separation of phenols and their derivatives, various sorption materials of physicochemical nature were used. It has been established that the most optimal sorbent, which separates almost all phenols and their derivatives, is polyoxyethylene bis arsenate, the molecule of which contains two arsenyl groups capable of intermolecular interactions with the analyzed sorbates. The dependences linking the logarithm relative to the retained volume of phenols on their dipole moments and refractive index, which have a linear form for the nonpolar sorbent of silaxane rubber SE-30, are revealed. A deviation from this dependence is observed when polyoxyethylene bis arsenate is used as a sorbent for ortho-Chlorophenol and ortho-Chrysol, which is associated with the screening of the hydroxyl group of phenols by functional substituents during the formation of an intermolecular hydrogen bond in the sorbate-sorbent system. Based on the developed methods, the water environment of the Volga River was analyzed for the content of phenols that exceed the MPC standards for almost all ingredients. The features of the gas chromatographic method for monitoring the content of phenols in an aqueous medium are considered, which consist in comparing the sorption characteristics of standard sorbents with polyoxyethylene bis arsenate, capable of forming an intermolecular bond due to the presence of arsenyl groups in the structure of its molecule with a nonpolar electron pair of an oxygen atom. It is found that both nonpolar and polar sorbents have a linear dependence of the logarithm of the relative retained volume of phenols on their dipole moments and refractive indices.