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Peat and its modification products as sorbents for remeval of metals, metalloids and nonmetallic elements

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For remediation of soils and purification of waters biosorbents might be considered as an prospective group of materials and amongst them peat have a special role due to low cost, biodegradability, high number of functional groups, well developed surface area and combination of hydrophilic/hydrophobic structural elements. We have demonstrated the possibilities to use peat and its thermal treatment products for oil sorption. Peat as an oil sorbent has poor buoyancy characteristics, relatively low oil sorption capacity and low hydrophobicity. However, thermal treatment (low-temperature pyrolysis and synthesis of peat-based active coal) helps to significantly improve its sorptive characteristics. The processes and structural changes taking place during low-temperature pyrolysis have been studied by means of IR spectroscopy, thermogravimetry and scanning electron microscopy. Peat can be used also as an efficient sorbent for sorption of metallic elements as it has been demonstrated on example of Tl+, Cu2+, Cr3+, however sorption capacity in respect to nonmetallic (anionic species) elements is low. To develop such application possibilities peat, peat modified with iron compounds, iron humates were prepared and tested for sorption of arsenic and phosphorous compounds in comparison with weakly basic anionites. The highest sorption capacity was observed when peat sorbents modified with iron compounds were used. Sorption of different arsenic speciation forms onto iron-modified peat sorbents was investigated as a function of pH and temperature. It was established that sorption capacity increases with a rise in temperature, and the calculation of sorption process thermodynamic parameters indicates the spontaneity of sorption process and its endothermic nature.