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Peat hybrid sorbents for treatment of wastewaters and remediation of polluted environment

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For remediation of soils and purification of polluted waters, wastewaters, sorbents 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. Peat as sorbent have good application potential for removal of trace metals, and we have demonstrated peat sorption capacities, sorption kinetics, thermodynamics in respect to metals with different valencies - Tl(I), Cu(II), Cr(III). However peat sorption capacity in respect to nonmetallic (anionic species) elements is low. Also peat mechanical properties do not support application in large scale column processes. To expand peat application possibilities the approach of biomass based hybrid sorbents has been elaborated. The concept “hybrid sorbent” in our understanding means natural, biomass based sorbent modified, covered with another sorbent material, thus combining two types of sorbent properties, sorbent functionalities, surface properties etc. As the “covering layer” both inorganic substances, mineral phases (iron oxohydroxides, oxyapatite) both organic polymers (using graft polymerization) were used. The obtained sorbents were characterised by their spectral properties, surface area, elemental composition. The obtained hybrid sorbents were tested for sorption of compounds in anionic speciation forms, for example of arsenic, antimony, tellurium 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. The recycling options of obtained compounds after their saturation with metal or non-metallic species are suggested.
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