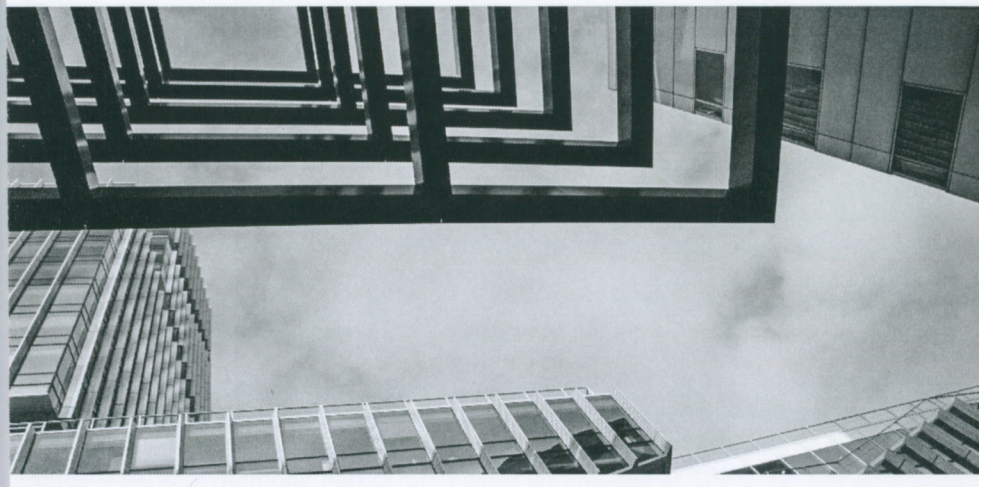
40 Porous Carbon Containing Clay Ceramic Pellets for Heavy Metal Removal from Water



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Water and wastewater pollution with heavy metals is a worldwide problem. There are a lot of methods for removal of heavy metals from wastewater. Adsorption is considered the most effective and economically viable one, and it also have a regeneration possibility of the adsorbent, thereby recovering the heavy metals as they cannot be destroyed or degraded, also the operation is sludge free. Activated carbon is one of the most widely studied material for removal of heavy metal like due to its high specific surface area and effective adsorption properties. Nevertheless, application of activated carbon in powder form in sorption process has some disadvantages, for example, agglomeration and difficulties with filtration due to very fine particles that form a dense filter layer in slurry phase operations. Not only must the adsorbents have sufficient adsorption properties but they also must be mechanically durable, easy to handle and produce and relatively cheap. Clay ceramic pellets have good mechanical properties and they are already used in water purification. Clay deposits are widespread and the preparation of pellets is not complicated. Also it is very important to acquire sufficient porosity but without decreasing mechanical properties. The porosity of the solid base has a direct positive effect on the adsorption capacity through increased surface area. The aim of this study is to prepare various porous clay ceramic pellets that contain carbon and to investigate their sorption properties towards heavy metals. The pellets were prepared from Latvian illitic clays with particle size < 250 μm. Potato starch, micro cellulose and sawdust were used as pore forming agents. Clays, pore forming agents and water were mixed, extruded, dried and cut into 8-10 mm long pellets. Then one part of the pellets was heated at 400°C for 1 hour, cooled, impregnated with sulfuric acid for 24 hours and pyrolysed at 500°C for 2 hours in nitrogen atmosphere. Then the pellets were washed to remove sulfate ions. The other part was pyrolysed at 500°C for 2 hours. The obtained carbon containing pellets were characterized with specific surface area, compressive strength and open porosity. Sorption ability towards Cu(II), Pb(II) and Ni(II) was investigated. Those pellets treated with sulfuric acid showed higher sorption properties then untreated ones. All pellets showed good mechanical properties, but the porosity increased in direction: potato starch < micro cellulose < sawdust. This work has been supported by the ERDF within the Activity 1.1.1.2 "Post-doctoral Research Aid" of the Specific Aid Objective of the Operational Programme "Growth and Employment" (No. 1.1.1.2/VIAA/1/16/049).