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著者(和文)	KHOSHBOUYLIGHVAN REZA
Author(English)	Reza Khoshbouy Lighvan
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Recently hydrothermal carbonization (HTC) has been emerged as a promising thermo-chemical biowaste conversion technology for the valorization by converting these precursors into high value-added products such as a nanostructured carbon. This research aims to investigate the effects of operating condition of the HTC on physico-chemical properties of its solid carbonaceous product, so called hydrochar (HC) ,which it can be used as a cost-effective carbon-based adsorbents. For this purpose, high moisture wastewater sludge (without pre-drying) and lignocellulosic waste were applied as biomass waste to produce functionalized carbon-based porous material. To enhance the physicochemical properties (such as surface functional group and porosity) of hydrochars, in-situ or ex-situ modification/ activation using acid or basic reagent was performed at various condition to produce modified HC with rich surface functional group or with high porosity. The subsequent objective of this research is to investigate the application of prepared modified carbon-based adsorbents for removal of organic and inorganic aqueous pollutants such as basic dye and heavy metal ion from aqueous solution. In this research, amongst the different methods of removing pollutants, adsorption on carbonaceous adsorbent was selected. finally, the commercial ACs was also compared with our materials and found that produced modified/activated hydrochars showed superior results for the removal of aqueous pollutants. Therefore, HTC can be considered as the potential carbonization method for biowaste conversion to valuable carbonaceous material in a cost-effective way.