Graphene Enhanced Concrete for Wastewater Treatment

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Abstract

Heavy metal ions from wastewater strongly adsorb to graphene and its derivatives. They can even be immobilized on hydrated cement surfaces in pervious concrete mixes. In this study, the removal of copper, lead, cadmium and zinc in a fixed bed based on pervious concrete and graphene coated aggregates was examined by performing column experiments for 10 h. Lead removal was exceptional throughout the experiment, regardless of the water head that operated on such fixed beds. Copper removal reached 92% when this operating water head was kept empty. This fixed bed permeability was marginally reduced as suspended clay particles in the wastewater clogged the pore channels. Calcium ions from such concrete matrices leached into percolated water, but this leaching was reduced by the graphene coat, which strengthened the interface between the aggregate and the cement paste. These experimental findings show that graphene-engineered pervious concrete has great potential in industrial wastewater treatment.