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Arsenic Removal from Drinking Water by Hybrid Hydrogel-Biochar Matrix: An Understanding of Process Parameters

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Abstract : Arsenic (As) contamination in drinking water is a serious concern worldwide resulting in severe health maladies. To tackle this problem, several hydrogel based matrix which selectively uptake toxic metals from contaminated water has increasingly been examined as a potential practical method for metal removal. The major concern in hydrogels is low stability of matrix, resulting in poor performance. In this study, the potential of hybrid hydrogel-biochar matrix synthesized from natural plant polymers, specific for As removal was explored. Various compositional and functional group changes of the elements contained in the matrix due to the adsorption of As were identified. Moreover, to resolve the stability issue in hydrogel matrix, optimum and effective mixing of hydrogel with biochar was studied. Mixing varied proportions of matrix components at the time of digestion process was tested. Preliminary results suggest that partial premixing methods may increase the stability and reduce cost. Addition of nanoparticles and specific catalysts with different concentrations of As(III) and As(V) under batch conditions was performed to study their role in performance enhancement of the hydrogel matrix. Further, effect of process parameters, optimal uptake conditions and detailed mechanism derived from experimental studies were suitably conducted. This study provides an efficient, specific and a low-cost As removal method that offers excellent regeneration abilities which can be reused for value.

Keywords : arsenic, catalysts, hybrid hydrogel-biochar, water purification
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