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Green synthesis of graphene-coated glass as novel reactive material for remediation of fluoride-contaminated groundwater

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ABSTRACT

The intent of this study was to elucidate a novel green method using low-grade Iraqi dates and glass waste granules to synthesize graphene-coated glass (GCG). This is a novel, economical, and effective reactive material that is very useful in permeable reactive barrier methodology for the remediation of fluoride-contaminated groundwater. The sorption process is controlled by factors such as the contact time, agitation speed, pH, and GCG dosage, which were investigated during batch processing. Two isotherm models (Langmuir and Freundlich) were used to explain the sorption data, while the continuous experimental results were fitted to the Bohart–Adams, Thomas–Bed Depth Service Time, and Clark breakthrough curve models. In the set of continuous experiments, the GCG-barrier performance was monitored, employing the concentrations of the effluent fluoride using different thicknesses of the barrier, inlet initial fluoride concentrations, and rates of flow.

Keywords: Graphene-coated glass; Fluoride; Sorption; Permeable reactive barrier; Transport