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Alginate-based Composite Materials For Uses In Protection And Decontamination Against Chemical Warfare Agents

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Activated carbon has been extensively investigated as an outstanding absorbent in numerous applications on industrial and environmental purposes including military uses owing to its high porosity with large surface area, low cost, and non-hazardous carbon-bearing product. Despite its excellent ability to remove toxic compounds by physical adsorption of non-volatile ones on the porous structures, decontamination of volatile gases and liquids has been a laborious task for pure activated carbon without any additives. Moreover, adsorbed compounds strongly bound to the surfaces of activated carbons can cause severe environmental problems for the long term. herein, to degrade chemical warfare agents by chemical mechanism in carbon matrices, various types of composite materials with metallic catalysts and decontaminants are fabricated by ion-exchange gel forming of sodium alginate, a polysaccharide stem from brown seaweed for its immobilizing properties with porous and functional materials. The objectives of this study utilizing alginate-based hydrogels are as follows: first, to make powder-type absorbents granulated with degradation capability via simple composite fabrication; second, to cover contaminated areas via sprayable and strippable coating for protection against off-gassing agents along with decontamination properties. The results from our works suggest the efficient yet facile strategs based on gel formation by alginate to impregnate additional functionalities onto classic materials for protection and decontamination of chemical warfare agents.

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