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Abstract

Film-Forming Polymeric Blends Designed for the Removal of Heavy Metals and Radionuclides from Contaminated Surfaces †

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Abstract: Surface decontamination is a vast domain. The majority of the methods use a considerable quantity of water, requiring further treatments. This study presents an ecological method for surface decontamination, based on polymeric nanocomposites, specially designed for the removal of heavy metals and radionuclides. Besides being effective in decontaminating the surfaces, these polymeric coatings also reduce the volume of the waste materials. The novelty of this work consists of the innovative path of combining the advantages brought by the film-forming ability of polyvinyl alcohol, with the remarkable metal retention capacity of bentonite nanoclay, together with the chelating ability of alginate, and with one of two 'new-generation 'green' complexing agents': iminodisuccinic acid (IDS) and 2-phosphonobutane-1,2,4-tricarboxylic acid (PBTC). These are used to obtain powerful, customizable, and environmentally friendly, film-forming, water-based solutions, for the surface decontamination of heavy metals or radioactive metals. Decontamination tests revealed a high decontamination efficiency for heavy metals (DF ≈ 95–98%, tested on glass surface) and also for radioactive metals (DF ≈ 91–97% for 241Am, 90Sr-Y and 137Cs, tested on metal, painted metal, plastic, and glass surfaces).This eco-friendly, low-waste, biodegradable method can successfully be employed, alternatively, to classical methods, having comparable capabilities for surface decontamination, but multiple advantages.

Keywords: decontamination; polymeric nanocomposites; strippable coatings; heavy metals; radioactive metals; radionuclides

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