Green" Biopolymers for Improved Surface Decontamination: Strippable Coating Properties and Sorptive Characterization*

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Understanding how heavy metal-chelating biopolymers coat and interact with contaminated surfaces will benefit the development of novel, safe, easy-to-apply decontamination methodologies for removal of radionuclides and heavy metals. Biopolymers are nonliving polysaccharide-based macromolecules, which are generated by microorganisms; they are nonhazardous, degradable, and incinerable natural polymers. These biopolymers increase the viscosity of aqueous solutions, allowing them to coat metal surfaces and interact with the surface to provide chemical interactions with increased contact time in place for solubilization and sorption. In this work, aqueous biopolymer solutions were used to coat contaminated steel surfaces to (1) solubilize the heavy metals (uranium) from the surface, (2) bind the heavy metals into the biopolymer, and (3) allow removal, by peeling, of the biopolymer-radionuclide complex. We have measured the metal sorption isotherms/capacities for different algal biopolymer fractions and have a preliminary biopolymer system which can remove 80% of the uranium (VI) from contaminated coupons (the biopolymer coating is removed as a dry, low-volume film or flakes with significantly less secondary waste in our initial system). Results will also be presented from experiments in which metal-chelating biopolymers are added to a commercially available strippable coating. It may be possible to improve upon existing strip-coat technologies, which rely strictly on physical sorption for metals removal, by incorporating a chemisorptive biopolymer component. Strippable coatings without enhancement have been used to successfully remove between 60 and 85% of metal surface contamination.