Design of Nanostructured Gum Acacia Silica Hybrid for Efficient Removal of Mercury

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ABSTRACT

The gum acacia has both hydroxyl and carboxylic acid groups in most of their polymer units and thus can be used as renewable scaffold for obtaining high performance functional materials. In the present study we have synthesized an efficient mercury adsorbent hybrid material by gum acacia templated polymerization of tetraethoxysilane. Sol gel synthesized gum acacia–silica hybrid on calcination furnished bio-inspired silica xerogels having excellent ability to bind mercury from solution. Hg(II) uptake from synthetic Hg(II) solution was used as a criterion for evaluating the adsorbent efficiency of the material. Conditions for the preparation were optimized by varying different reaction constituents. For obtaining the best possible material in terms of mercury (II) binding, different ratios of H_2O:TEOS:EtOH were taken at fixed gum acacia and catalyst amount, where 4:1:1 ratio was found to be most favorable. To explore the other applicability areas, the hybrids have been extensively characterized using FTIR, XRD, SEM, TEM and BET analysis. These polysaccharide-silica hybrids are indicated to be potentially useful in biomedical and optical applications.

***Keywords**:* Hybrid, Gum acacia, TEOS, Template, Mercury sorption