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ABSTRACTS

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O28.5 - CITRIC ACID CROSSLINKED LIGNOCELLULOSIC HYDROGEL BEADS FOR THE REMOVAL OF CHROMIUM FROM WASTEWATER

Environmental Remediation
Materials & Engineering

citric acid crosslinked LIGNOCELLULOSIc hydrogel BEADS FOR THE REMOVAL OF CHROMIUM FROM WASTEWATER

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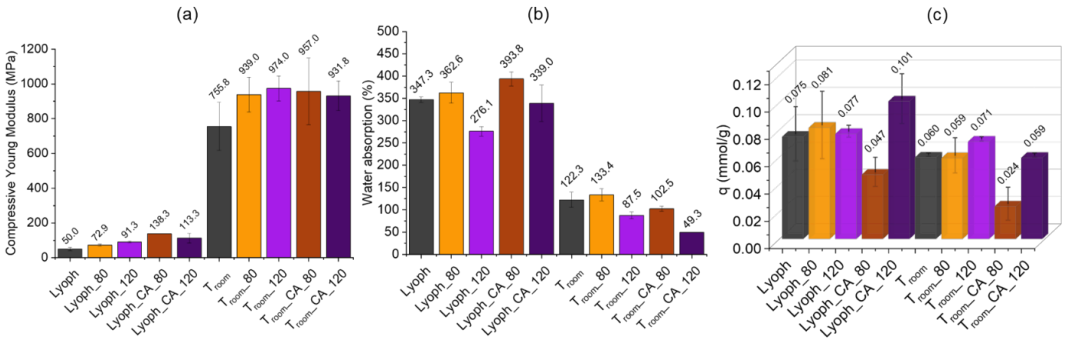
Lignocellulose-based sorbents were evaluated for their effectiveness in removing toxic metals as chromium from industrial wastewaters. A bis(ethylenediamine)-copper(II) hydroxide solution (CUEN) was used to deconstruct sisal fiber and subsequently produce hydrogel beads aimed at removing Cr(VI) from wastewater. The medium composed of dissolved cellulose and hemicelluloses, and suspended lignin, was dropped to a calcium chloride solution to create hydrogel spheres. The dried beads (8 g) (room temperature, or lyophilization) were soaked into 200 mL of citric acid (CA) solution (20 %) and put into an oven at 80 ºC and 120 ºC to promote the crosslinking reaction. The viscosity average molar mass (M_v) of the beads redissolved in CUEN was assessed to evaluate the role of CA in the cellulose chains' hydrolysis. The beads' sorption capacity (q/mmol/g) was obtained by putting the beads in contact with a Cr(VI) aqueous solution (analyzed via UV-VIS spectroscopy). Figure 1 presents the beads compressive Young modulus (a), water swelling (b), and q towards Cr(VI) (c).



Legend

Lyoph – lyophilized **T_{room} – dried at room temperature**

Lyoph_80 – lyophilized and treated at **T_{room}_80 – dried at room temperature and**

80 ºC	**treated at 80 ºC**
Lyoph_120 – lyophilized and treated at 120 ºC	**T_{room}_120 – dried at room temperature and treated at 120 ºC**
Lyoph_CA_80 – lyophilized and crosslinked with CA at 80 ºC	**T_{room}_CA_80 – dried at room temperature and crosslinked with CA at 80 ºC**
Lyoph_CA_120 – lyophilized and crosslinked with CA at 120 ºC	**T_{room}_CA_120 – dried at room temperature and crosslinked with CA at 120 ºC**

Figure 1. Young modulus under compression (a); Water swelling (b); chromium sorption capacity of the beads (c) (C_i = 1 mM, S/L ratio = 1 g/L, T = 25 ºC, time = 24 h, pH = 4.0).

The FTIR spectra indicated that the esterification of the –OH groups only occurred at 120 ºC. The hydrogels' M_v reduced until one magnitude order for the samples crosslinked with CA, which means CA hydrolyzed notably the cellulose chains. CA crosslinking increased the Young's modulus of the freeze-dried beads; however, this effect was not observed in the T_{room} series (Figure 1(a)), despite the latter exhibiting a higher modulus. Figure 1(b) shows that the lyophilization confers a higher water absorption to the beads, due to higher porosity corroborated by SEM images. CA crosslinking of the lyophilized samples had a positive impact on the *q* of Cr(VI) (Figure 1 (c)). This research shows the potential of sisal-based hydrogels crosslinked with CA, for eliminating Cr(VI) from wastewater while adhering to sustainability principles. Funding: São Paulo Research Foundation Brazil (#2023/07447-2), National Council for Scientific and Technological Development, Brazil (403494/2021-4).