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Adsorbent biopolymers based on *Couroupita guianensis*

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Introduction: A biopolymer oil sorbent was produced, aiming to remove oil spills from the sea. More than 80% of the world's energy matrix is still fossil fuels, which meet the energy demands but can potentially harm the environment during its production and processing or through its use (1-6). For this reason, a biopolymer obtained from renewable raw material, the pulp of *Couroupita guianensis*, a plant native to the Brazilian Amazon region and Atlantic Forest, as well as in other regions of the planet. The motivation of the present work is to synthesize high-density composite packing and absorption composites using the formed biopolymer. The effect of packing density, type, and amount of binder on porous properties as well as thermal conductivity were studied. The biopolymer showed various magnetics nanoparticles contents incorporated into synthesized materials.

Methods: In this work, fractions of *Couroupita guianensis* pulp were prepared and mixed with toluene diisocyanate and tin octanoate. The biopolymer characteristics were prepared with the insertion of maghemite nanoparticles into a polymer matrix, aiming to make the removal of the polymer material containing petroleum from the water surface easier. This study used FTIR spectroscopy (Fourier Transform Infrared Spectroscopy) to assess the biochemical changes. The prepared materials were tested to absorb crude oil. In addition, swelling and mesh parameters including maximum oil absorption (Qmax), swelling kinetics rates, solvent-polymer interaction (χ), effective cross-linking density (νe), equilibrium modulus of elasticity (GT) and average molecular weight between cross-links (Mc) were verified and correlated with the absorption efficiency of the synthesized material.

Results & Discussions: The FTIR spectrum of the pulp peaks at 3155.54, 2985.81, 1743.65, 1442.75, 1242.16, 1049.28, 933.55, 848.68, 786.96 and 702.09 cm -1 correspond to the functional groups such as carboxylic acids (O–H stretch), alkenes (C–H stretch), carboxylic acids (C=O stretch), aromatics (C–C stretch (in–ring)), alcohols, carboxylic acids, and esters, respectively. The stigmatic tissue; x400 of the sample showing canals equal in number to the carpels; x40.-10. The efficiency of the extract was also confirmed by microscopic visualization. The kinetic curves of ions sorption on modified cellulose phytochemicals of *Couroupita guianensis* at pH 7 shows that sorption equilibrium in heterogenic system ion–metal–sorbent was attained in 40–60 min. The oil and composite were magnetically removed, and the mass of the oil residue could be determined by gravimetry. In addition, tested materials presented an average cure degree equal to (99.1 ± 0.2)%, which means that, after an oil extraction by solvents, the sorbers can be reused, as proved by three additional tests, which showed that oil removal capability remained the same.

Conclusions: *Couroupita guianensis* fruit extract was presented as a novel bio reductor agent, useful for instant green synthesis of oil-sorbent composite. The addition of magnetic nanoparticles into the polymer matrix allowed the production of a magnetic composite, which possesses a good magnetic force. One single gram of the best material was able to remove 15 g of oil from the water. This result can be improved by changing the amount of magnetic nanoparticles in the material.

Key words: *Couroupita guianensis, Biopolymer, Sorbent, Magnetic composites, Synthesis*

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