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Electrospun Fibers Made from Biopolymers (Cellulose Acetate/Chitosan) for Metals Recovery

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Abstract : A biodegradable material is developed with adsorptive capacity for metals ion for intended use in mining tailings mitigating the environmental impact with economic retribution, two types of fibers were elaborated by electrospinning: (1) a cellulose acetate (CA) matrix and (2) a cellulose acetate (CA)/chitosan (CH) matrix evaluating the effect of CH in CA on its physicochemical properties. Through diffuse reflectance infrared fourier transform spectroscopy (DRIFTS) the incorporation of chitosan in the matrix was identified, observing the band of the amino group at 1500 - 1600 [cm-1]. By scanning electron microscopy (SEM), Hg porosimetry, and CO2 isotherm at 273 [K], the intrafiber microporosity and interfiber macroporosity were identified, with an increase in the distribution of macropores for CA/CH fibers. In the tensile test, CH into the matrix produces a more ductile and tenacious behavior, where the % elongation at break increased by 33% with the other parameters constant. Thermal analysis by differential scanning calorimetry (DSC) and Thermogravimetric Analysis (TGA) showed that the incorporation of chitosan produces higher retention of water molecules due to the functional groups (amino groups (- NH3)), but there is a decrease in the specific heat and thermoplastic properties of the matrix since the glass transition temperature and softening temperature disappear. The effect of the optimum pH for CA and CA/CH fibers were studied in a batch system. In the adsorption kinetic study, the best isotherm model adapted to the experimental results corresponds to the Sips model and the kinetics corresponds to pseudo-second order

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