Title (2)	:	**Sulfur dioxide removal using deep eutectic solvent–functionalized palm kernel shell–activated carbon**
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Abstract	:	The release of SO2 into the atmosphere is concerning due to its role in acidification, which threatens living organisms and the environment. Adsorption processes using materials like chemically modified activated carbon (AC) have demonstrated strong potential for removing SO2 before its release. This study evaluates the performance of AC derived from palm kernel shells, and AC functionalized with choline chloride-glycerol, a deep eutectic solvent (DES) (AC-DES), in removing SO2 through breakthrough experiments conducted in a fixed bed reactor. AC and AC-DES achieved SO2 adsorption capacities of 0.522 and 2.763 mg SO2/g adsorbent, respectively. Characterization of the adsorbents indicated that DES functionalization significantly increased the number of active sites for SO2 adsorption, leading to superior adsorption performance of AC-DES. The optimization of process parameters identified 40 °C and 1500 ppm inlet SO2 concentration as the ideal conditions for optimal SO2 adsorption. Experimental data fitted with three adsorption kinetic and isotherm models indicated that SO2 adsorption onto AC-DES is best described by the Avrami kinetic model and the Sips isotherm model. Thermodynamics studies revealed that the process is exothermic, thermodynamically non-spontaneous, and goes from a random state to an ordered one. The findings suggest that SO2 adsorption onto AC-DES follows a complex mixed mechanism involving both physisorption and chemisorption, with surface heterogeneity and adsorbate-adsorbent interactions playing a critical role in controlling the adsorption process.