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Abstract	:	The increasing concentration of atmospheric CO₂ remains a significant driver of climate change, highlighting the need for innovative and sustainable carbon capture technologies. This study investigates the CO₂ adsorption performance of composites comprising of choline glycinate ([Chl][Gly])-impregnated on ZIF-8, focusing on low ionic liquid (IL) loadings (4 wt.%, 8 wt.%, and 12 wt.%) optimize adsorption efficiency. The use of the biocompatible and biodegradable [Chl][Gly] aims to balance physisorption and chemisorption mechanisms. Single-component CO₂ adsorption isotherms, nitrogen adsorption studies, and scanning electron microscopy (SEM) were employed to characterize the gas interactions within these composites across a wide pressure range. Experimental results demonstrate that the 4 wt.% composite achieved a CO₂ uptake of 26.34 mmol/g at 1 bar, exceeding the uptake of pristine ZIF- 8 (23.59 mmol/g) while preserving structural stability. At higher pressures (20 bar), the 12 wt.% composite exhibited a CO₂ uptake of 434.91 mmol/g, compared to 367.67 mmol/g for pristine ZIF-8. These results highlight the potential of these composites for efficient CO₂ capture and suggest a promising approach for advancing carbon mitigation strategies.