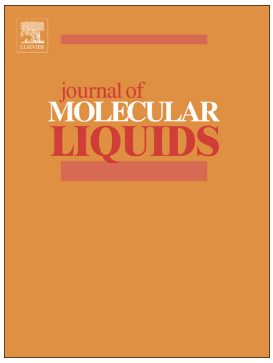


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# Experimental study on $CO_2$ sorption capacity of the neat and porous silica supported ionic liquids and the effect of water content of flue gas

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**Abstract:**

In this research, absorption of $CO_2$ in different ionic liquids (ILs) is studied. Thus four ILs were synthesized containing 1-butyl-3-methylimidazolium as the cation and nitrate $[NO_3]^-$, thiocyanate $[SCN]^-$, dicyanamide $[N(CN)_2]^-$ and hydrogen sulfate $[HSO_4]^-$ as the anions, respectively. The resulting ILs were then immobilized into activated silica support in a 1/1 IL/$SiO_2$ weight ratio via the impregnation-vaporization method. $CO_2$ sorption behavior of both neat and silica supported ILs (ILs-$SiO_2$) were investigated at different temperatures and flow rates under atmospheric pressure, while their desorption process were carried out under 20 mmHg at 70$^o$C. In both sorbents, the best results were obtained at 25$^o$C with a flow rate of 12 mL/min, where [bmim][$N(CN)_2$] with 1.85 (wt%) or 0.42 mmol $CO_2$ per gram of sorbent and [bmim][$HSO_4$]-$SiO_2$ with 2.33 (wt%) or 0.53 mmol $CO_2$ per gram of sorbent showed the highest sorption capacities. The effect of water on $CO_2$ absorption capacity of the neat and silica supported ILs were also studied by transmission of $CO_2$ gas flue containing 400 ppm water. The results indicated that the mass gain was higher when wet $CO_2$ was passed through the sorbents, opposed to passing dry $CO_2$. Because of the existence of a weak coulombic intraction between the sorbents and $CO_2$, desorption occurs rapidly and a readily reuse of the sorbents is therefore provided.

**Key words**: Carbon dioxide, Sorption, Desorption, Supportted ionic liquid, ILs-loaded silica

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