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Investigation of ionic liquids for efficient removal and reliable storage of radioactive iodine: a halogen-bonding case

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Supplementary information

1. Removal experiments

UV/Vis spectra have been carried out with a sample pool with an optical length of 10 mm, within the wavelength range 280–700 nm, using the same solvent in the analyzed solution as a blank. Due to limits of our instrument, the evolution UV/vis spectrum for iodine in cyclohexane solution shows only one certain absorption peak λ = 522 nm. The intensity of absorption peak was proportional with the quantity of I_2. The curve of calibration was obtained by four solutions (0.0254, 0.0508, 0.0762, 0.102, 0.127 and 0.152 g/L).

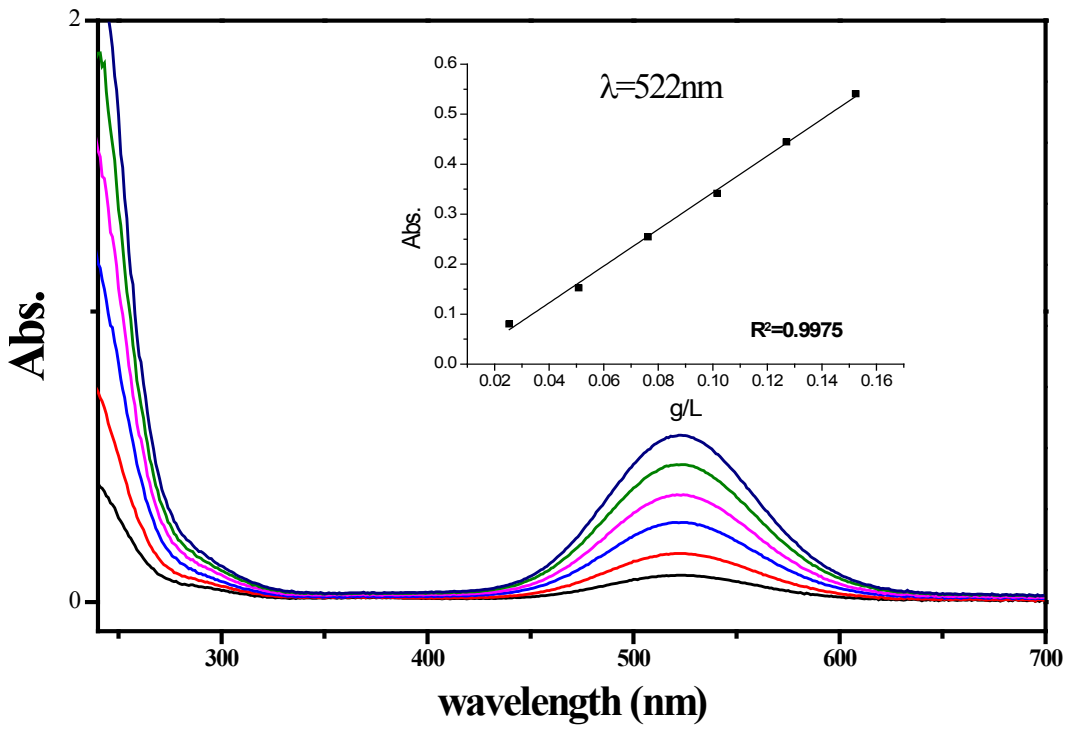

Fig. S1 Calibration plot of iodine in cyclohexane by UV/vis spectra.

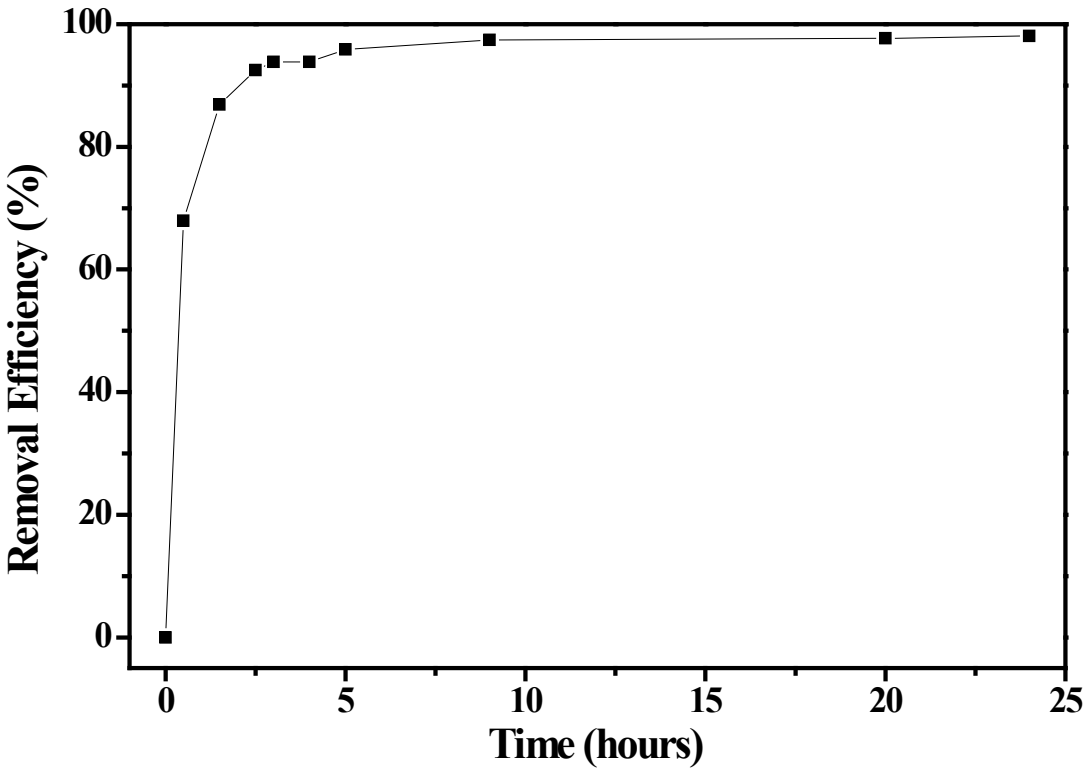

Fig. S1b Iodine removal kinetics of [BPy][Br] (volume of I_2 in cyclohexane = 5 ml, concentration =0.01 mol L^{-1}, amount of ILs = 0.1 g).

Experimental details: UV/vis spectroscopy was applied to characterize the supernatant and determine the iodine concentration, and details are given as follows: 30 μL of the supernatant was taken and diluted into 10 mL. The systematic error of this method is ~0.5%, which is negligible.

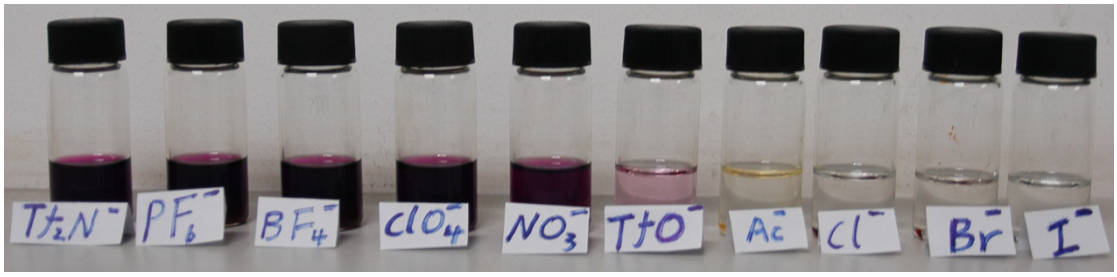

Fig. S1c Picture showing the visual color change after sorption of iodine through the [Bmim]-based ILs (C_i = 0.01M, t = 24h and at room temperature).

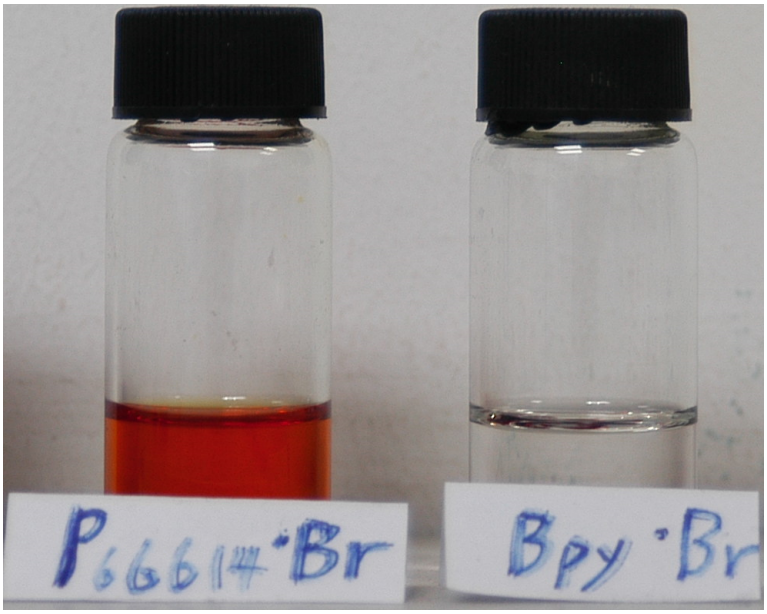

Fig. S1d Picture showing the visual color change after sorption of iodine through two ILs (C_i = 0.01M, t = 24h and at room temperature). The reddish color of supernatant of [BPy][Br] (left) indicates the existence of strong intermolecular interaction between this IL and iodine molecule.

2. Nitrogen Sweeping experiments

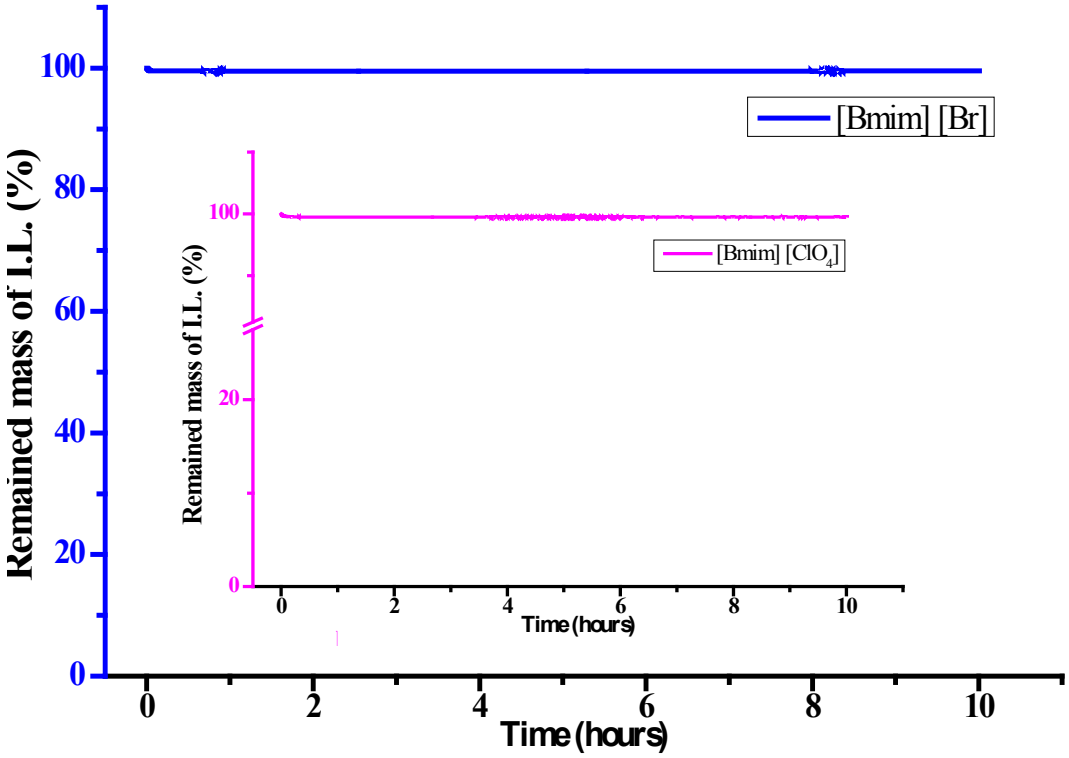

Fig. S2 The non-volatility of sorption agents was reassured under the scrutiny of TGA.

3. Volatility of I_2.

Fig. S3 Picture showing the escape of the iodine from storage bottle bottom to bottle cap after 30 days at room temperature.