Supporting Information

For

Porous Liquid Constructed from Single-Walled Polyoxometalate Nanotubes for Sustainable Extractive-Oxidative Desulfurization

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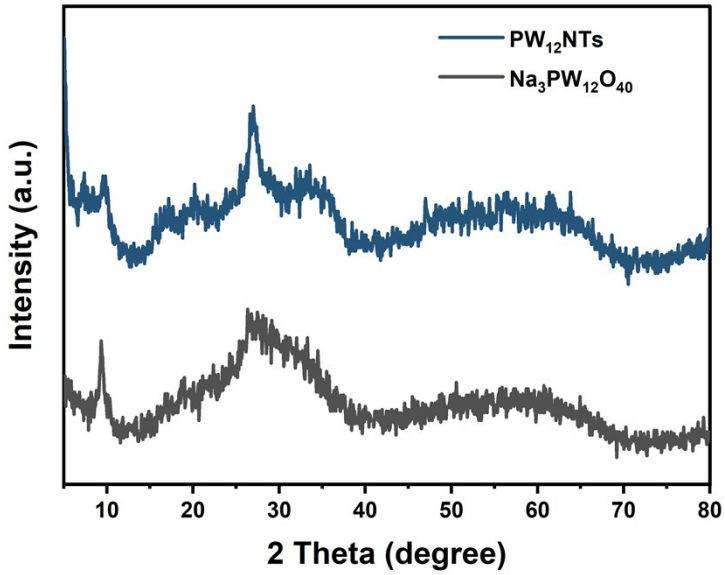

Figure S1. XRD patterns of samples.

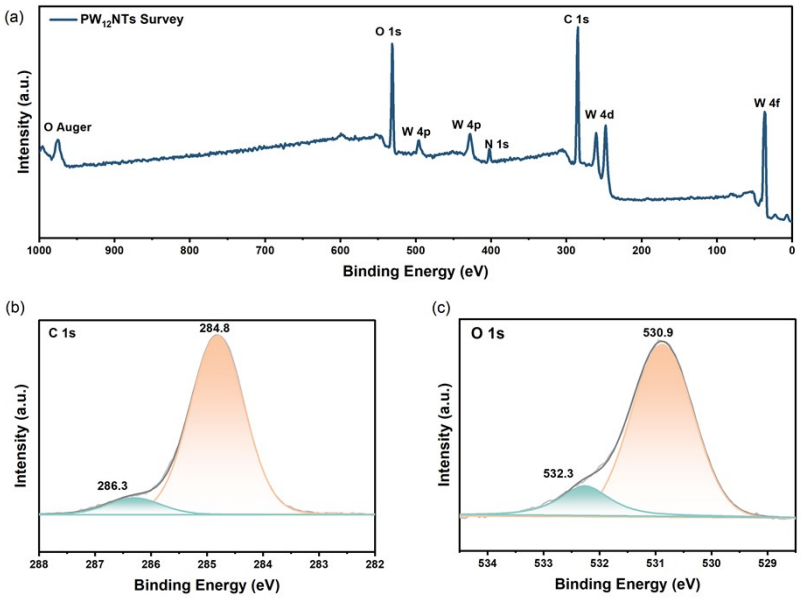

Figure S2. (a) XPS survey of PW_{12}NTs; (b) C1s; (c)O1s

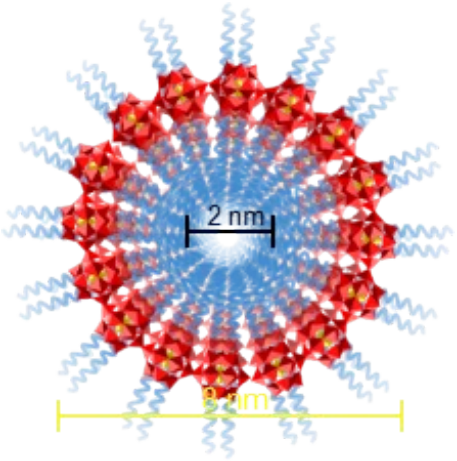

Figure S3. Cross-sectional simulated pore of POM single-walled nanotubes

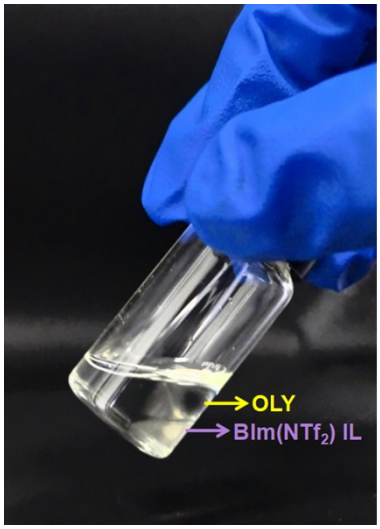

Figure S4. An optical image of the two-phase mixture.

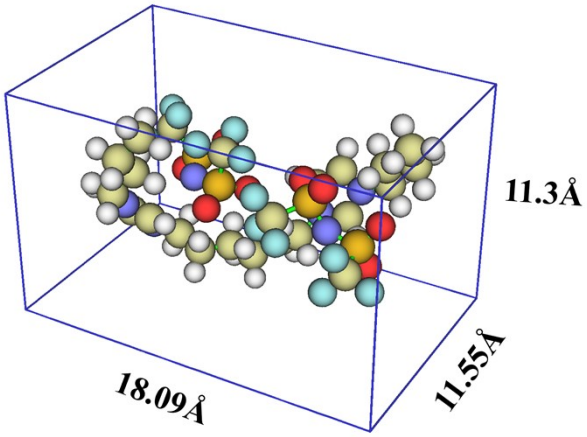

Figure S5. The simulated structure of $BIm(NTf_2)$ ILs.

The geometry optimization was performed at B3LYP+D3/6-31G* in Gaussian 16.[1] The molecular size of $BIm(NTf_2)$ ILs was calculated by Multiwfn 3.8(dev) code.[2] The density of the $BIm(NTf_2)$ ILs is 1.37 g/m^2 at 20°C.

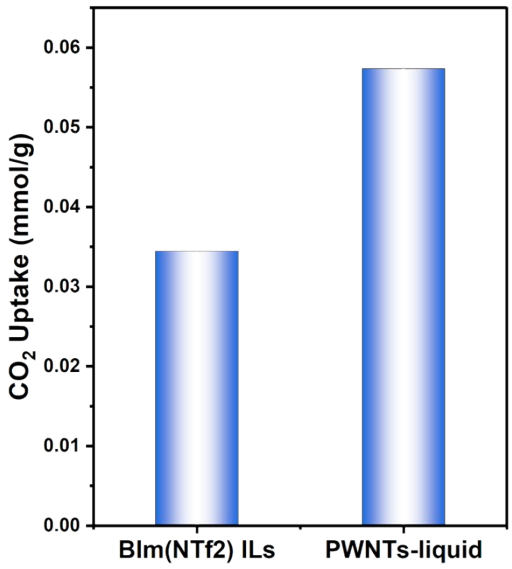

Figure S6. CO_2 uptake of BIm(NTf_2) ILs and 1% PWNTs-liquid collected at 298 K and 1bar, respectively.

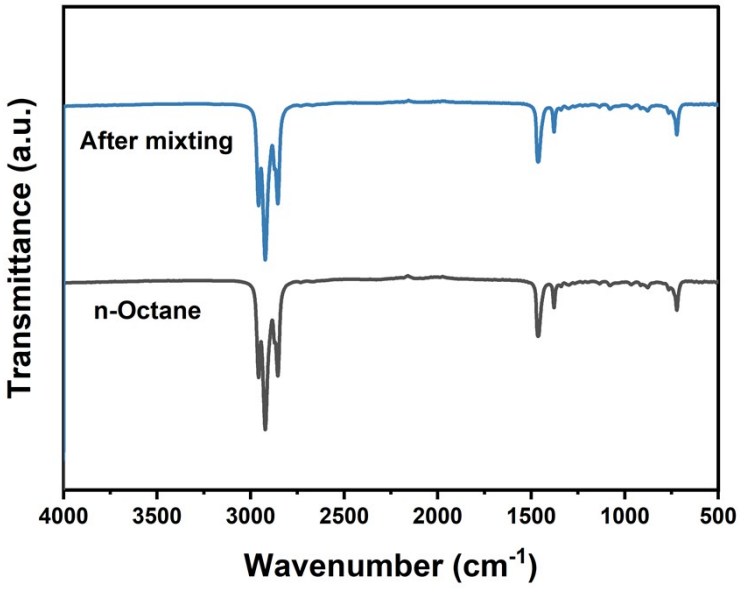

Figure S7. FTIR spectra of the reused model fuel oil and *n*-octane.

Table S1. Comparison of the recycle performance of various porous liquids in the desulfurization process

PILs	Solvent matrix	Porous framework	Recycle times	Sulfur Removal (%)	Ref.
PILs-UiO-66	[Omim][NTF_2]	UiO-66	4	81.3	[3]
ZIF-8/[Bpy][NTf2]	[Bpy][NTf_2]	ZIF-8	4	41.41	[4]
OS-PIL	PEGS	silica	5	< 20	[5]
ZIF-8/[THTDP][BTI]	[THTDP][BTI]	ZIF-8	3	26.3	[6]
m-BN-PIL	[BPy][$FeCl_4$]	m-BN	3	36.4	[7]
UiO-66-BAPILs	[BSPy][CF_3SO_3]	UiO-66	4	80.5	[8]
PS-OS@PEGIm-800	PEGIm	porous silica	5	44.2	[9]
PIL-UiO-66	[Bmim][NTf_2]	UiO-66	8	94.9	[10]
UiO-66(7%)-T3PILs	[$P_{6,6,6,14}$][NTf_2]	UiO-66	3	81.3	[11]
PILS-M	[Bpy][NTf_2]	HPMo@ZIF-8	8	89.9	[12]
PILS-B	[Bmim]BF_4	HESAC@SBA-15	7	96.5	[13]
PWNTs-liquid	BIm(NTf_2) ILs	PW_{12} NTs	20	96.1	This work

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