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Electronic supplementary information

Carbon Based Ionic Liquid Gels: Alternative adsorbents for Pharmaceutically Active Compounds in Wastewater

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Figure S1. a) Strain and b) frequency sweep.



Figure S2. SEM image of graphite/PF₆ xerogel.



Figure S3. Pictures of a) water in contact with hybrid gels after adsorption, b-d) dispersion of graphite in water, c-e) water in contact with graphite/ PF_6 gel after 5h.



Figure S4. UV spectra of dispersion of graphite in water and water after 5h of contact with graphite/PF₆ gel.



Figure S6. ¹H NMR spectra of: D_2O after 5 h of contact with **graphite/NTf**₂ with 5-HMF as internal standard (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).



Figure S7. UV spectra of PhAC solutions as function of contact time with gel.



1.0 10.5 10.0 9.5 9.0 8.5 7.5 7.0 6.5 6.0 5.5 f1 (ppm) 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 8.0

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Figure S8. ¹H NMR spectra of: the mixture extracted after the desorption of carbamazepine from **graphite/PF**₆ with 2-Me-THF in CD₃OD with 5-HMF as internal standard (red), colored asterisks identify protons of the components in the mixture; gelator in D₂O (green); 5-HMF in D₂O (blue).



Figure S9. ¹H NMR spectra of: the mixture extracted after the desorption of carbamazepine from **graphite/PF**₆ with ethyl-lactate using DMSO-d₆ and 5-HMF as internal standards (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).



Figure S10. Pictures of a) solvents (2-Me-THF, ethyl-lactate, 1-octanol, isoamyl alcohol) in contact with hybrid gels after desorption cycles, b) stability of hybrid gels after desorption of carbamazepine.



Figure S11. UV spectra of PhAC mixtures and single PhACs before and after adsorption on gel.

Table S1. RE of **graphite/PF**₆ for the adsorption of $[CBZ] = 1.8 \cdot 10^{-4}$ M after 5 h for several adsorption cycles on the same gel and recycling cycles after desorption of the gel. RE is based on triplicate runs with a reproducibility of 3%.

Recycling cycle	RE %	RE % after desorption
1	83	85
2	74	79
3	74	74
4	59	73
5	52	71
6	62	73
7	57	69
8	59	67
9	40	68
10		61
11		57

Table S2. Desorption of CBZ from graphite/PF₆ after 9 cycles of adsorption in different solvents.

Solvent of desorption	CBZ extracted (%)	Extraction cycles	Release of [bmim][PF ₆] (%)
2-Me-THF	80	7 x10 min	17
Ethyl-lactate	58*	3 x 5 min*	20
1-octanol	11	3 x 30 min	
Isoamyl alcohol	25	3 x 30 min	

* reduction of gel volume was observed after the third cycle of desorption.

Table S3. RE of graphite/PF₆ as function of CBZ initial concentration. RE is based on triplicate runs with a reproducibility of 3%.

Concentration (M)	RE % at 5 h	RE % at 24 h
6.3 ·10 ⁻⁵	96	100
1.3 .10 -4	89	89
1.8 ·10 ⁻⁴	86	90
3.1 ·10 -4	75	95
3.4 - 10 - 4	78	94
1.0 -10 -3	36	86

Table S4. RE of **graphite/PF**₆ as function of stirring rate at 5h, 25 °C with an initial concentration of CBZ of $1.8 \cdot 10^{-4}$ M. RE is based on triplicate runs with a reproducibility of 3%.

Rate of stirring (rpm)	RE (%)
0	86
200	85
400	96
800	98

Table S5. RE of graphite/PF₆ as function of volume of CBZ ($1.8 \cdot 10^{-4}$ M) cast on 0.5 mL of gel after 5 h of contact in static (0 rpm)or dynamic (800 rpm) conditions. RE is based on triplicate runs with a reproducibility of 3%.

Volume (mL)	RE % static	RE % dynamic
	condition	condition
0.6	83	99
1.2	37	86
2.4	19	31
3.6	1	36

Table S6. RE of **graphite/PF**₆ in mixtures of PhACs ($1.8 \cdot 10^{-4}$ M) after 24 h of contact. RE is based on triplicate runs with a reproducibility of 3%.

PhAC solution	RE % NXA	RE % CBZ	RE % DCF
NXA	46	-	-
CBZ	-	91	-
DCF	-	-	48
NXA, CBZ, DCF	71	58*	58*
CBZ, DCF	-	75*	75*
NXA, DCF	43	-	-
NXA, CBZ	77	-	-

* RE of total basic PhACs, comprising both CBZ and DCF.