Electronic supplementary information

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

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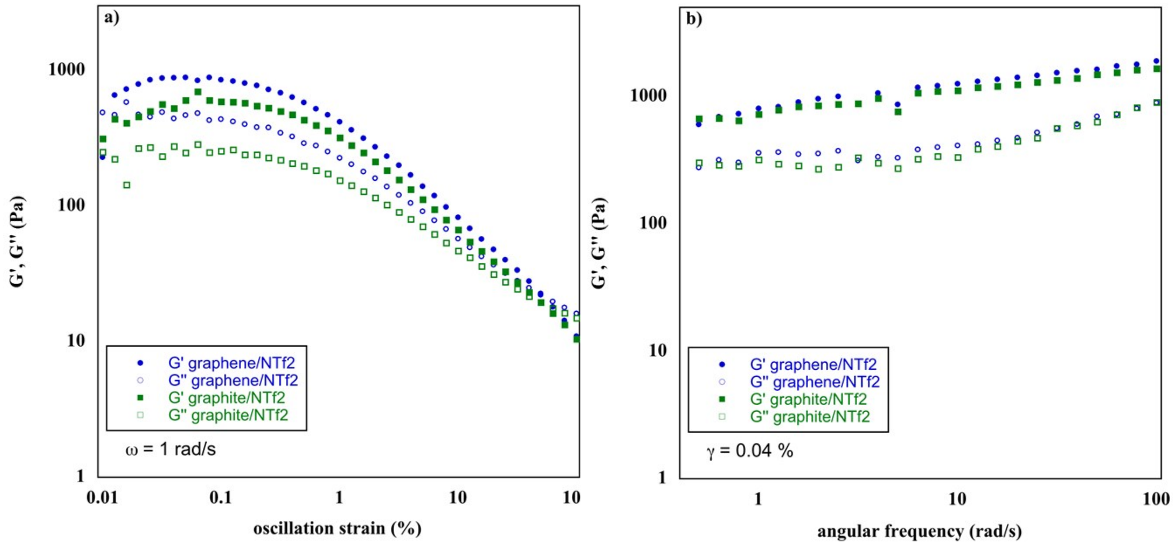


Figure S1. a) Strain and **b)** frequency sweep.

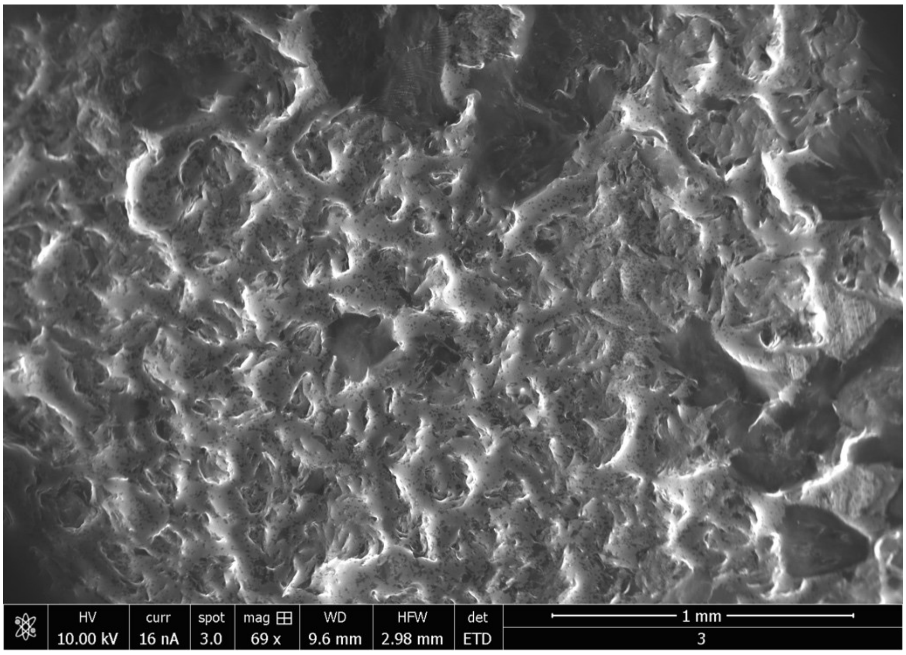


Figure S2. SEM image of graphite/PF_6 xerogel.

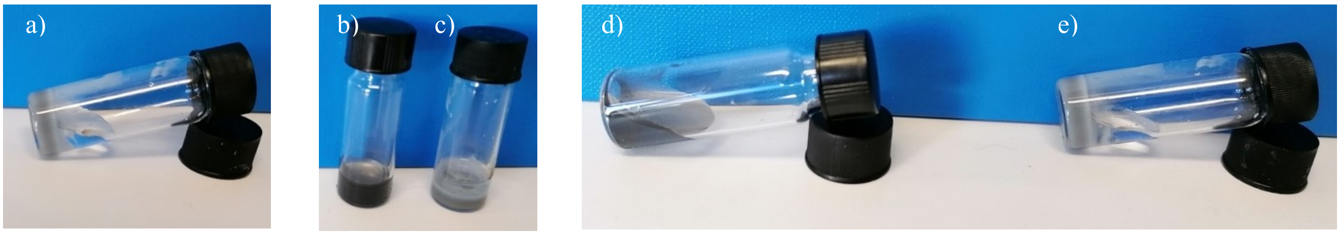


Figure S3. Pictures of **a)** water in contact with hybrid gels after adsorption, **b-d)** dispersion of graphite in water, **c-e)** water in contact with **graphite/PF_6** gel after 5h.

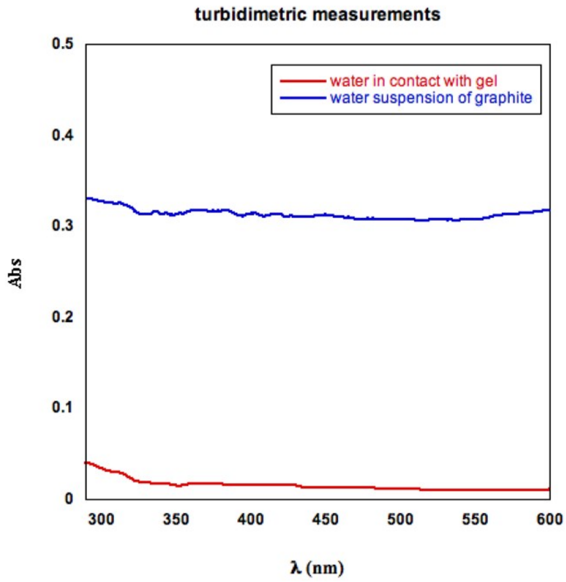


Figure S4. UV spectra of dispersion of graphite in water and water after 5h of contact with **graphite/PF_6** gel.

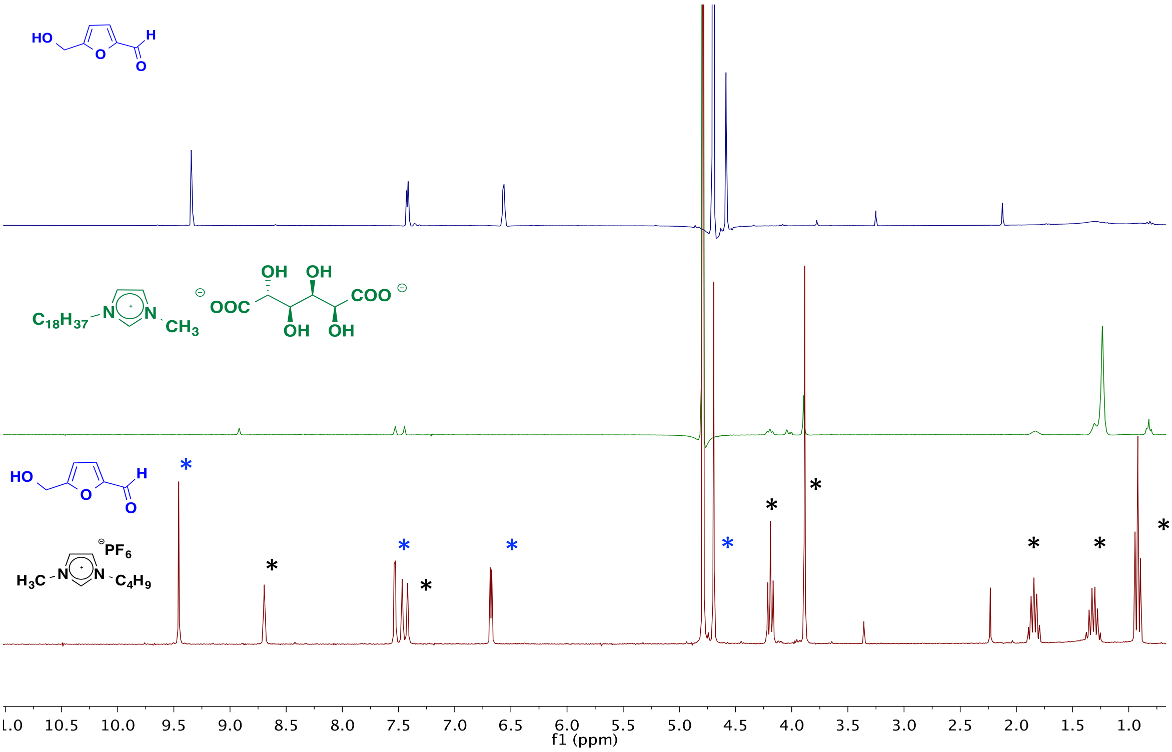


Figure S5. [1]H NMR spectra of: D_2O after 5 h of contact with **graphite/PF$_6$** with 5-HMF as internal standard (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).

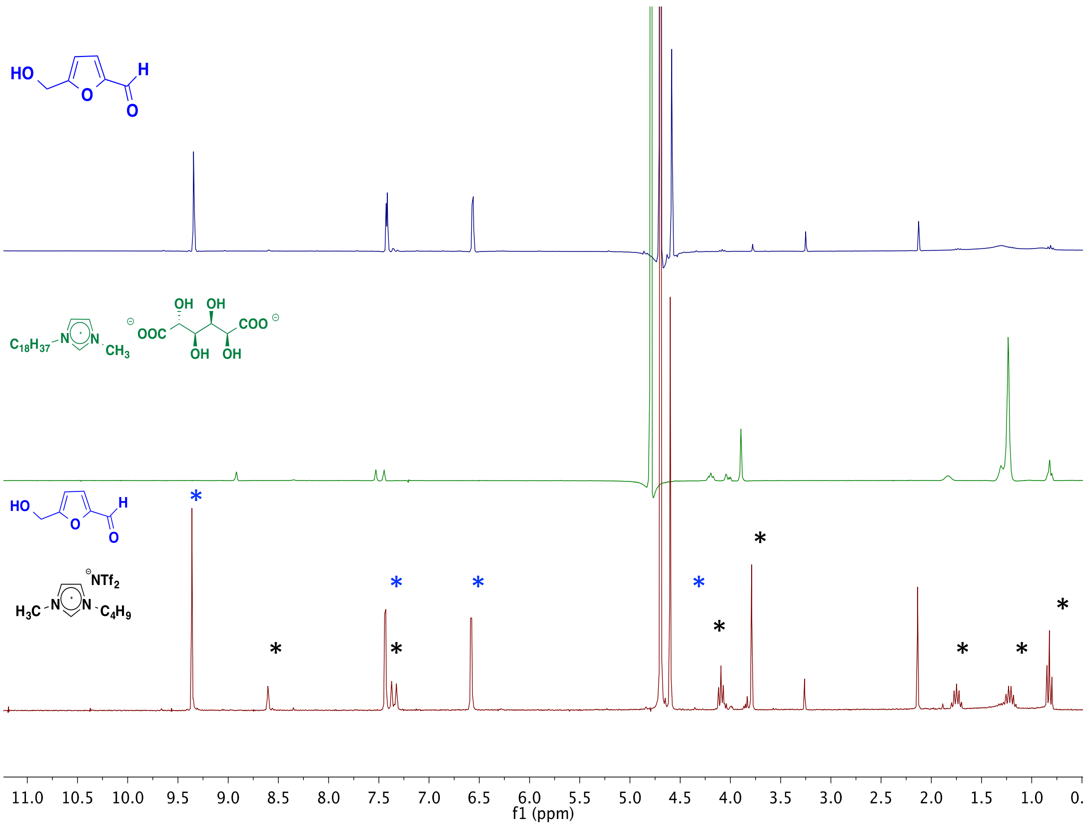


Figure S6. [1]H NMR spectra of: D_2O after 5 h of contact with **graphite/NTf$_2$** with 5-HMF as internal standard (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).

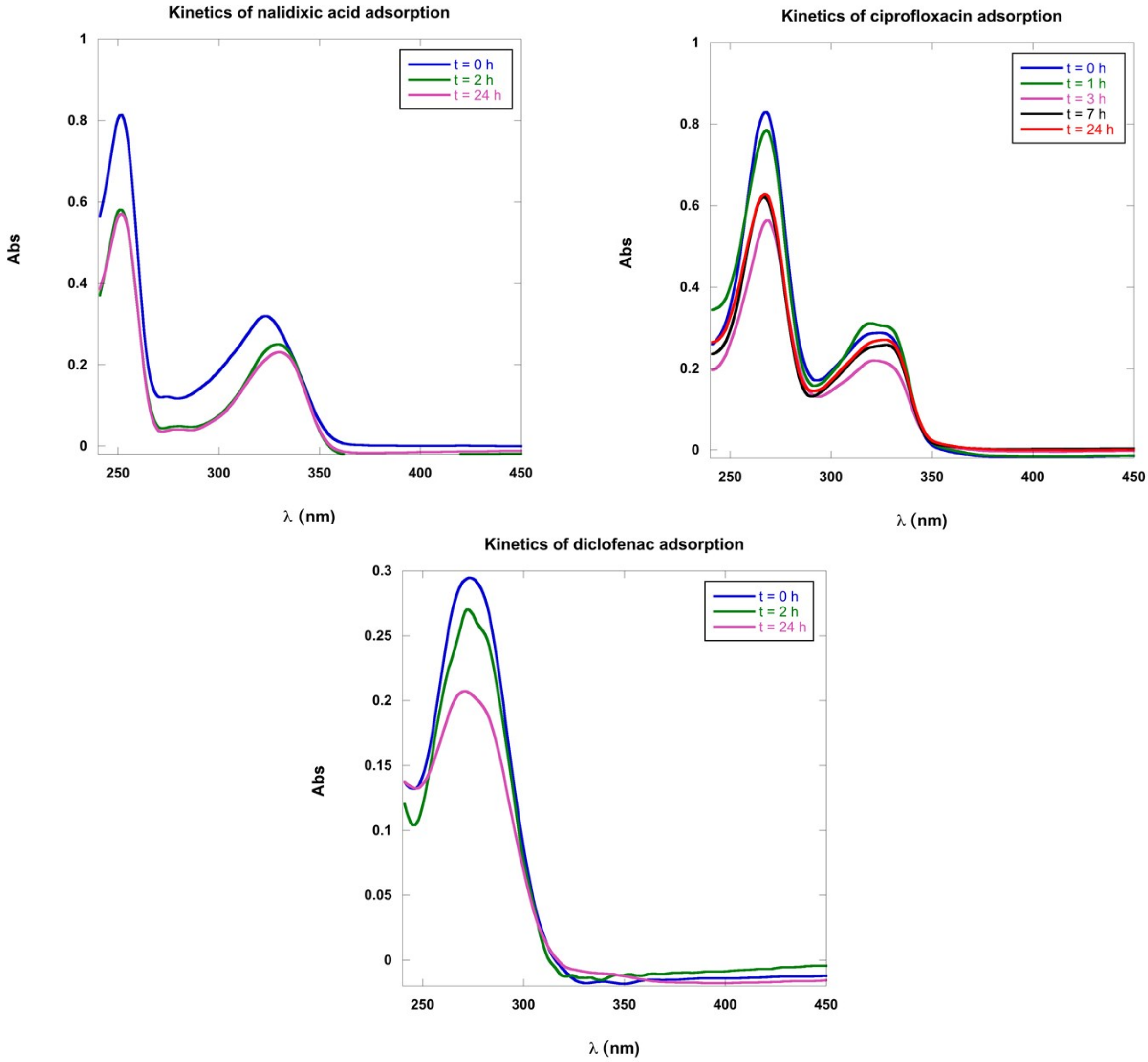


Figure S7. UV spectra of PhAC solutions as function of contact time with gel.

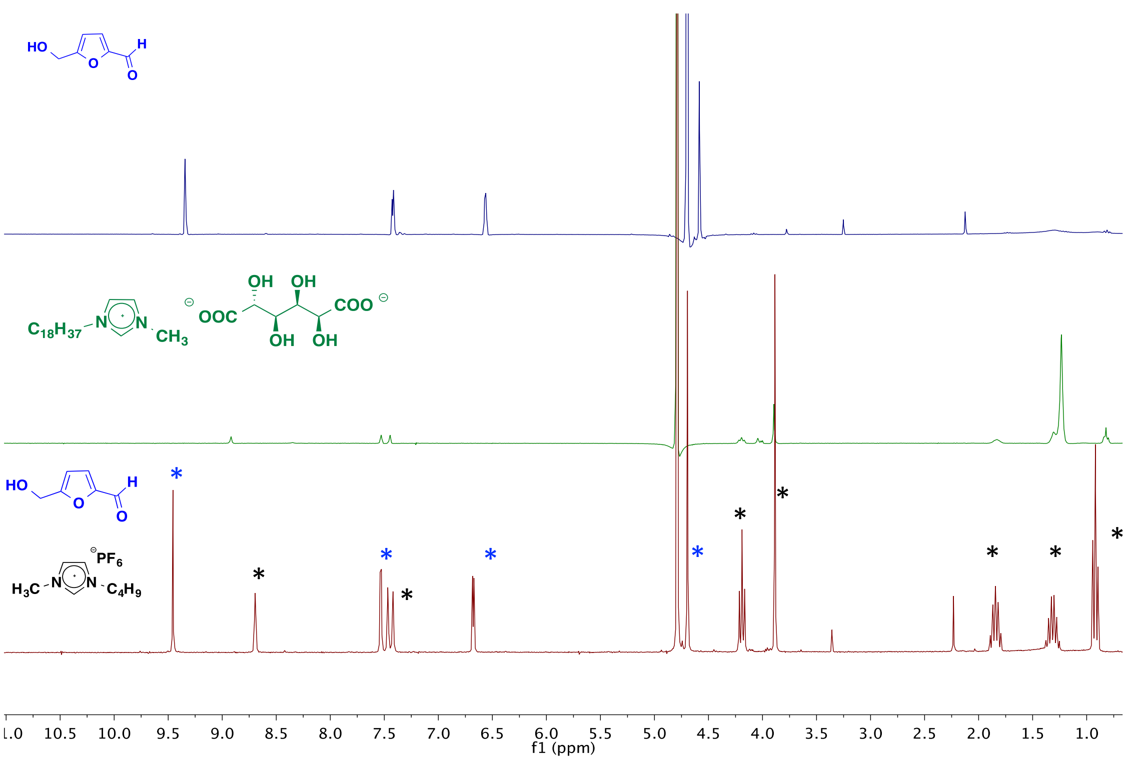


Figure S8. ^{1}H NMR spectra of: the mixture extracted after the desorption of carbamazepine from **graphite/PF$_6$** with 2-Me-THF in CD_3OD with 5-HMF as internal standard (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).

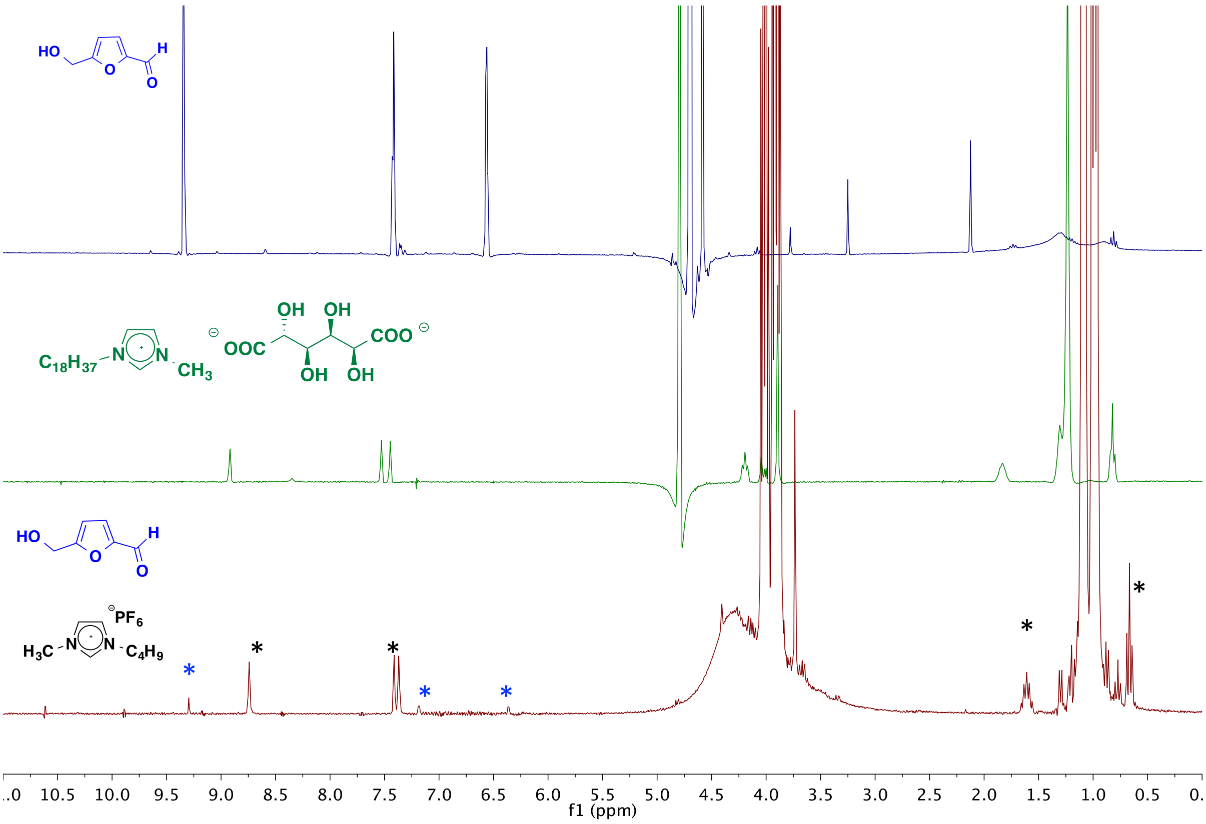
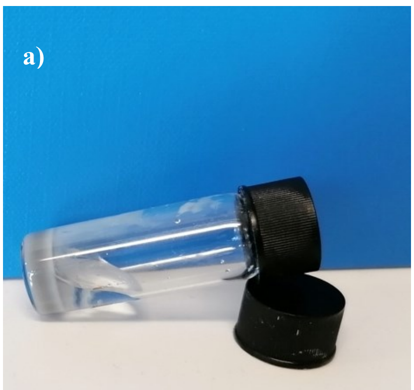


Figure S9. ^{1}H NMR spectra of: the mixture extracted after the desorption of carbamazepine from **graphite/PF$_6$** with ethyl-lactate using DMSO-d$_6$ and 5-HMF as internal standards (red), colored asterisks identify protons of the components in the mixture; gelator in D_2O (green); 5-HMF in D_2O (blue).



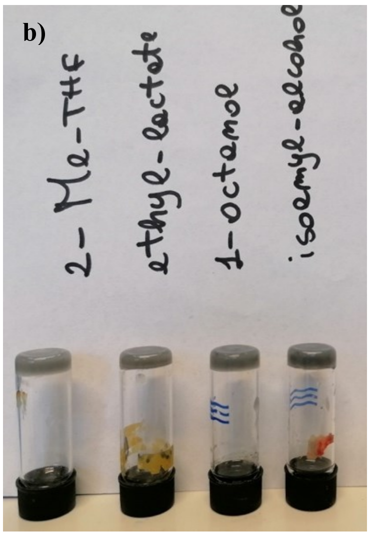


Figure S10. Pictures of **a)** solvents (2-Me-THF, ethyl-lactate, 1-octanol, isoamyl alcohol) in contact with hybrid gels after desorption cycles, **b)** stability of hybrid gels after desorption of carbamazepine.

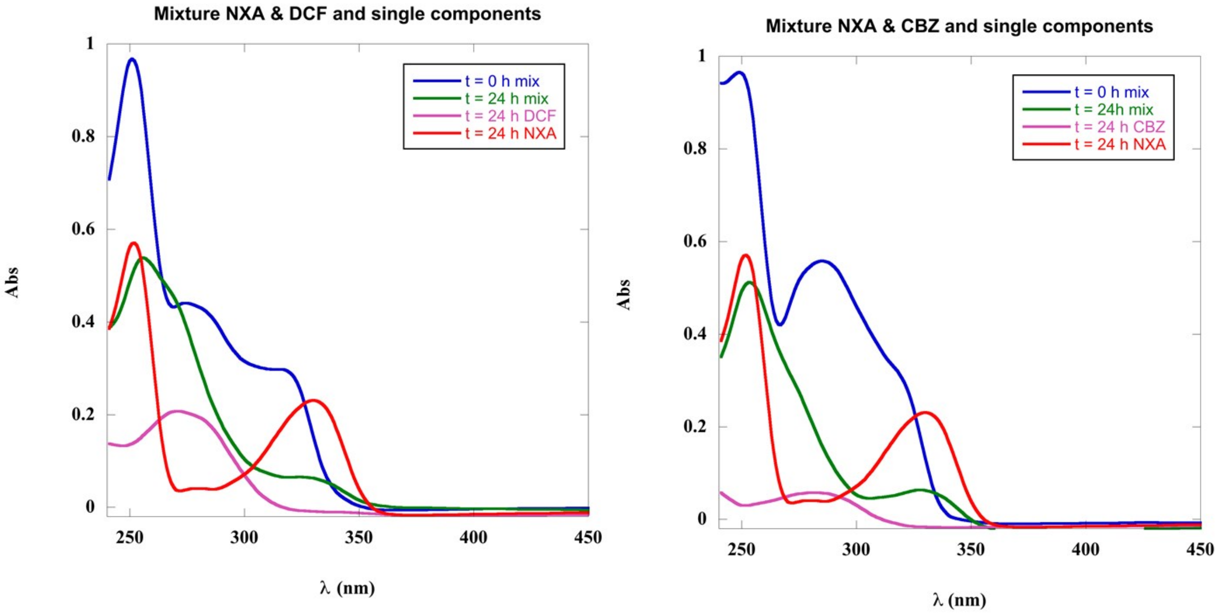


Figure S11. UV spectra of PhAC mixtures and single PhACs before and after adsorption on gel.

Table S1. RE of **graphite/PF$_6$** for the adsorption of [CBZ] = 1.8 ·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/PF$_6$** 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/PF$_6$** 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/PF_6** 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 condition	RE % dynamic 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.