Table S1. The adsorption energies (E_{ads}) (kJ/mol) and the geometrical parameters (bond lengths (R) is in Å) for the PEN drug molecule and γ-Fe_2O_3 before and after the adsorption process in the gas phase and water solution.

Configuration		E_{ads}	Interaction	Bond	$R_{in\ \gamma\text{-}Fe2O3}$	$R_{incomplex}$	Bond	$R_{in\ PEN}$	$R_{incomplex}$
GAS	A	-69.246	N65-H43 = **1.84**	O41-H43	0.968	0.991	C61-N65	1.464	1.469
			O3 -H73 = **1.90**	O3-H60	0.966	0.969	N65-H73	1.015	1.029
			O67-H24 = **1.93**	O23-H24	0.967	0.975	C62-O67	1.214	1.222
			O67-H60 = **2.21**	O03-H60	0.966	0.969	C62-O67	1.214	1.222
	B	-46.444	O67-H43 = **1.74**	O41-H43	0.968	0.988	C62-O67	1.214	1.229
			O19-H71 = **1.85**	O19-H20	0.966	0.966	O64-H71	0.973	1.020
			N65-H58 = **1.80**	O04-H58	0.968	1.006	C61-N65	1.464	1.481
			O3-H73 = **2.16**	O3-H60	0.966	0.966	N65-H73	1.017	1.025
	C	0.996	S66-H43 = **2.61**	O41-H43	0.968	0.974	S66-H74	1.348	1.355
			O9-H74 = **2.10**	Fe6-O09	1.820	1.888	S66-H74	1.348	1.355
PCM	A	-65.597	N65-H43 = **1.76**	O41-H43	0.968	1.003	C61-N65	1.464	1.472
			O3-H73 = **2.14**	O03-H60	0.968	0.970	N65-H73	1.019	1.023
			O67-H24 = **1.99**	O23-H24	0.968	0.975	C62-O67	1.216	1.224
			O67-H60 = **2.17**	O3-H60	0.968	0.970	C62-O67	1.216	1.224
	B	-31.305	O67-H43 = **1.73**	O41-H43	0.968	0.992	C62-O67	1.216	1.237
			O19-H71 = **1.47**	O19-H20	0.968	0.967	O64-H71	0.974	1.051
	C	11.924	S66-H43 = **3.47**	O41-H43	0.968	0.968	S66-H74	1.347	1.348
			O9-H78 = **2.62**	O9-H50	0.974	0.974	C69-H78	1.094	1.093

Table S2. the calculated thermodynamic properties, i.e., the free Gibbs (ΔG) and enthalpy (ΔH) energies (kJ/mol), the chemical potential (μ), chemical hardness (η) and the stretching frequencies (Δν, in cm^{-1}), for the pristine γ-Fe2O3, PEN and the PEN/γ-Fe_2O_3 complexes in the gas phase and water solution.

Phase	Model	μ	η	ΔH	ΔG	Δν
GAS	**γ-Fe_2O_3**	-4.882	0.526	-	-	-
	PEN	-3.239	3.147	-	-	-
	A	-4.606	0.591	-87.156	-26.137	ν_{N-H} : 3493.92→3300.45 = -424.27
	B	-4.891	0.574	-81.955	-22.661	ν_{O-H} : 3738.13→ 2840.92= -897.21
	C	-4.880	0.526	-9.447	34.538	ν_{S-H} : 2686.91 → 2596.92= -89.99
PCM	**γ-Fe_2O_3**	-5.024	0.550	-	-	-
	PEN	-3.392	3.238	-	-	-
	A	-5.051	0.566	-82.262	-19.400	ν_{N-H} : 3363.71→2770.15 = -593.56
	B	-5.130	0.588	-53.978	-4.001	ν_{O-H}: 3724.72 → 2291.78 = -1432.94
	C	-5.053	0.566	4.889	48.446	ν_{S-H}: 2693.88 → 2680.93= -12.95

Table S3. The topological parameters, the density of the total energy of electrons (H_{BCP}) and its two components, the kinetic (G_{BCP}) and potential (V_{BCP}) electron energy densities (all in a.u.), the hydrogen bond energy (E_{HB}, in kJ/mol) The values of the LUMO, the HOMO, energy gap (E_g) for PEN, the pristine γ-Fe2O3 nanoparticle and the considered complexes in the gas phase and water solution.

γ-Fe_2O_3 ... $(O,N,Cl)_{PEN}$

		Bond	ρ_{BCP}	$\nabla^2\rho_{BCP}$	H_{BCP}	V_{BCP}	G_{BCP}	E_{HB}	E_{LUMO}	E_{HOMO}	E_g
GAS	γ-Fe2O3	-	-	-	-	-	-	-	**-4.356**	**-5.408**	**1.052**
	PEN	-	-	-	-	-	-	-	**-0.092**	**-6.386**	**6.294**
	A	$N_{65}…H_{43}$	0.0396	0.0913	-0.0056	-0.0340	0.0284	-44.601	**-4.014**	**-5.197**	**1.183**
		$O_{3}…H_{73}$	0.0306	0.0852	-0.0015	-0.0243	0.0228	-31.911			
		$O_{67}…H_{24}$	0.0236	0.0759	0.0007	-0.0175	0.0182	-22.986			
		$O_{67}…H_{60}$	0.0157	0.0502	-0.0014	-0.0098	0.0112	-12.876			
	B	$O_{67}…H_{43}$	0.0396	0.1240	-0.0029	-0.0098	0.0339	-48.205	**-4.317**	**-5.465**	**1.148**
		$O_{19}…H_{71}$	0.0525	0.1361	-0.0098	-0.0537	0.0438	-72.427			
		$N_{65}…H_{58}$	0.0429	0.0920	-0.0075	-0.0379	0.0305	-49.761			
		$O_{3}…H_{73}$	0.0184	0.0534	0.0008	-0.0118	0.0126	-15.524			
	C	$S_{66}…H_{43}$	0.0126	0.0360	-0.0010	-0.0069	0.0080	-9.081	**-4.364**	**-5.396**	**1.032**
		$O_{9}…H_{74}$	0.0212	0.0516	-0.0004	-0.0136	0.0133	-17.873			
PCM	γ-Fe2O3	-	-	-	-	-	-	-	**-4.474**	**-5.575**	**1.101**
	PEN	-	-	-	-	-	-	-	**-0.154**	**-6.630**	**6.476**
	A	$N_{65}…H_{43}$	0.0484	0.1027	-0.0099	-0.0455	0.0356	-59.675	**-4.536**	**-5.567**	**1.031**
		$O_{3}…H_{73}$	0.0187	0.0543	0.0007	-0.0121	0.0128	-15.851			
		$O_{67}…H_{24}$	0.0216	0.0681	-0.0009	-0.0153	0.0162	-20.076			
		$O_{67}…H_{60}$	0.0165	0.0502	-0.0011	-0.0103	0.0114	-13.526			
	B	$O_{67}...H_{43}$	0.0425	0.1271	-0.0043	-0.0403	0.0360	-52.903	**-4.542**	**-5.718**	
		$O_{19}…H_{71}$	0.0820	0.1455	-0.0323	-0.1010	0.0687	-132.607			**1.176**
	C	$O_{19}…H_{74}$	0.0082	0.0253	0.0012	-0.0040	0.0052	-5.267	**-4.487**	**-5.620**	**1.133**
		$O_{9}…H_{78}$	0.0072	0.0231	0.0012	-0.0035	0.0046	-4.532			
		$O_{13}…H_{75}$	0.0066	0.0212	0.0011	-0.0031	0.0042	-4.082			

Table S4. The second-order perturbation energy ($E^{(2)}$, kcal/mol) corresponds to charge transfer between the oxygen lone pairs and σ*O–H anti-bonding orbital for three models of the PEN/γ-Fe_2O_3 complexes.

		Charge transfer	$E^{(2)}$
GAS	**A**	LP N65→ σ* O41-H43	**28.04**
		LP O67 → σ* O23- H24	**6.82**
	B	LP N65 → σ* O4 - H58	**23.00**
		LP O67→ σ* O41-H43	**11.08**
	C	LP S66 → σ* O41- H43	**4.60**
PCM	**A**	LP N65→ σ* O41-H43	**30.51**
		LP O67 → σ* O23- H24	**4.53**
	B	LP N65 → σ* O4 - H58	**16.99**
		LP O67→ σ* O41-H43	**11.24**
	C	LP S66 → σ* O41- H43	**0.25**

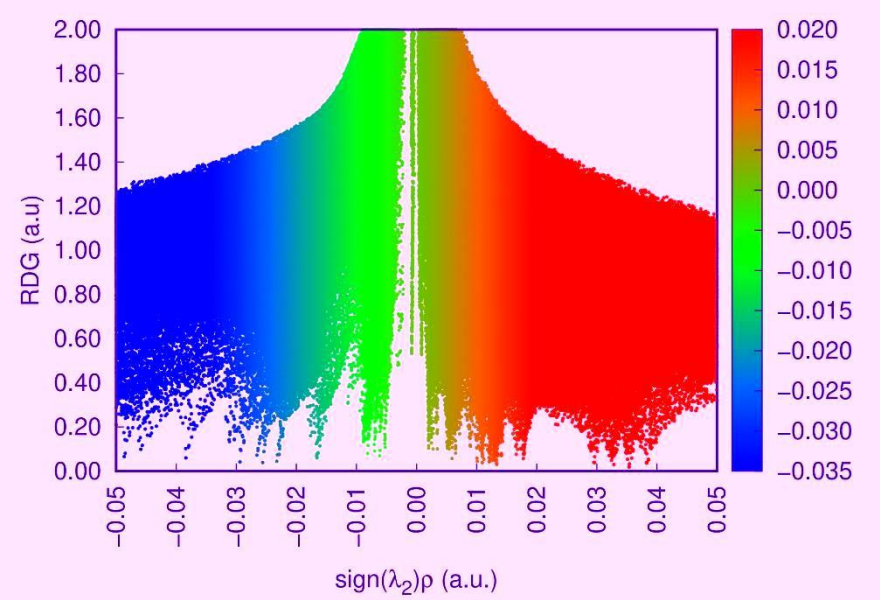

Figure S1. The RDG vs sign(λ_2)ρ plots for complex **A**.

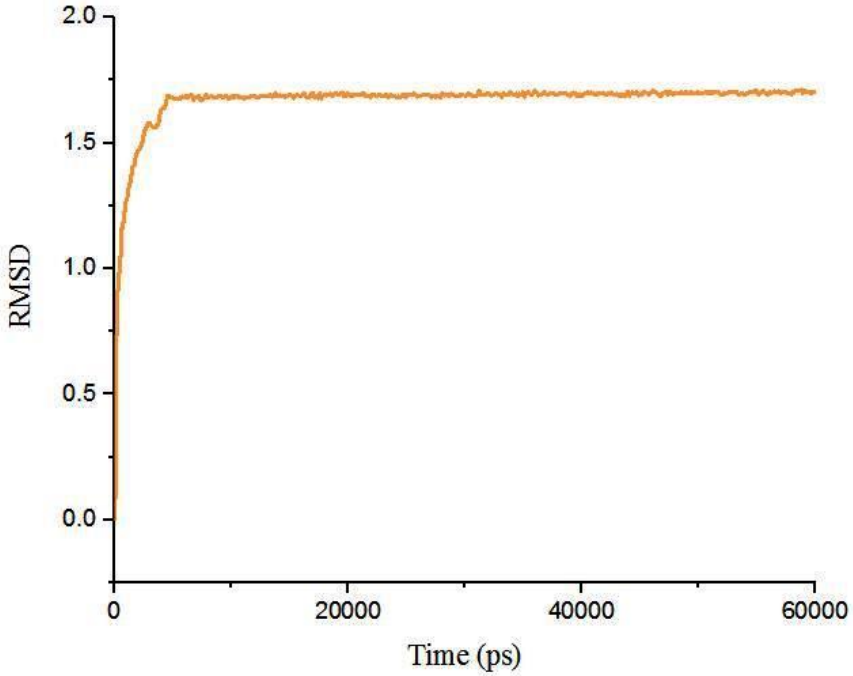

Figure S2. RMSD curve for the simulated system as a function of time.