Supporting Information

Self-Assembly-Directed Aerogel and Membrane Formation from a Magnetic Composite: An Approach to Developing Multifunctional Materials

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Membrane Permeability Test

The membrane permeation was tested by dead end filtration method, The membrane pressure was adjusted using nitrogen gas. The membrane was subjected to a stabilized flux with ultrapure water and the allowed to filter water at different pH and different pressure. The permeability were calculated using equation 1

$$J = \frac{V}{A\Delta T} \qquad (1)$$

Here, J is the permeability (L/m^2h),Vis the permeated volume of water (L), A is thenarea of membrane (0.9 cm^2) and T is the permeation time (min).

Stability of the membrane

The stability of the membrane was calculated in terms of weight loss in different solvent by following the equation 2

$$W = [1 - \frac{W_d}{W_s}] \qquad (2)$$

Where, W is the weight loss, W_d and W_s are the weight of dried membrane and solvent treated dried membrane.

Membrane swelling degree

The dried membrane was fist weighed and immersed in to an aqueous solution, at each time interval the membrane was taken out from the solution and weighed. After the membrane reached a constant weight, membrane was wiped with tissue paper, dried and weighed.The swelling degree was calculated using the equation 3.

$$SD = \frac{W_d}{W_s} \qquad (3)$$

Where SD is the swelling degree, W_d and W_s are the weight of dried membrane and swelled membrane.

Oil adsorption experiment

The oil adsorption experiment was done by using engine oil. The aerogel (10 mg)was cut in to cube shape and place on the oil on water in a petri dish. At each time intervals the aerogel were taken out and weighed. The oil absorption capacity was find out by using the following equation.

$$Absorption\ capacity = \frac{W_{adsorbed} - W_{dry}}{W_{dry}} \qquad (4)$$

Where, $W_{adsorbed}$ is the weight of oil adsorbed gel and W_{dry} is the weight gel before adsorption.

Desalination Experiment

The saline water was prepared by dissolving 33W% of NaCl in 1L of deionized water.The filtration experiment was done by using glass funnel and conical flask based filtration set up with membrane holder .The concentration of the salt was measured by using ICP-OES spectrometer.

$$q_e = \frac{(C_o - C_e)V}{m} \qquad (5)$$

where C_e is the equilibrium concentration, q_e corresponds to adsorption amount at equilibrium, C_o is the initial concentration of salt , V and m are the volume of solution and mass of the membrane , respectively.

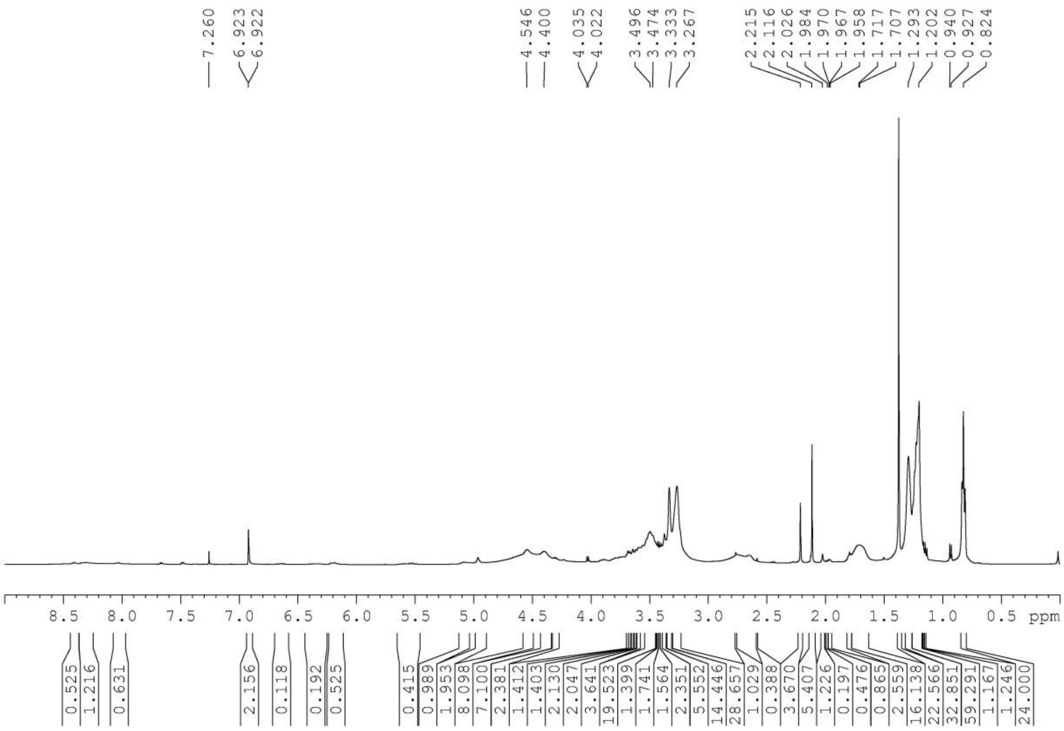


Figure S1: ^{1}HNMR spectra of PAMAMOS in deuterated DMSO.

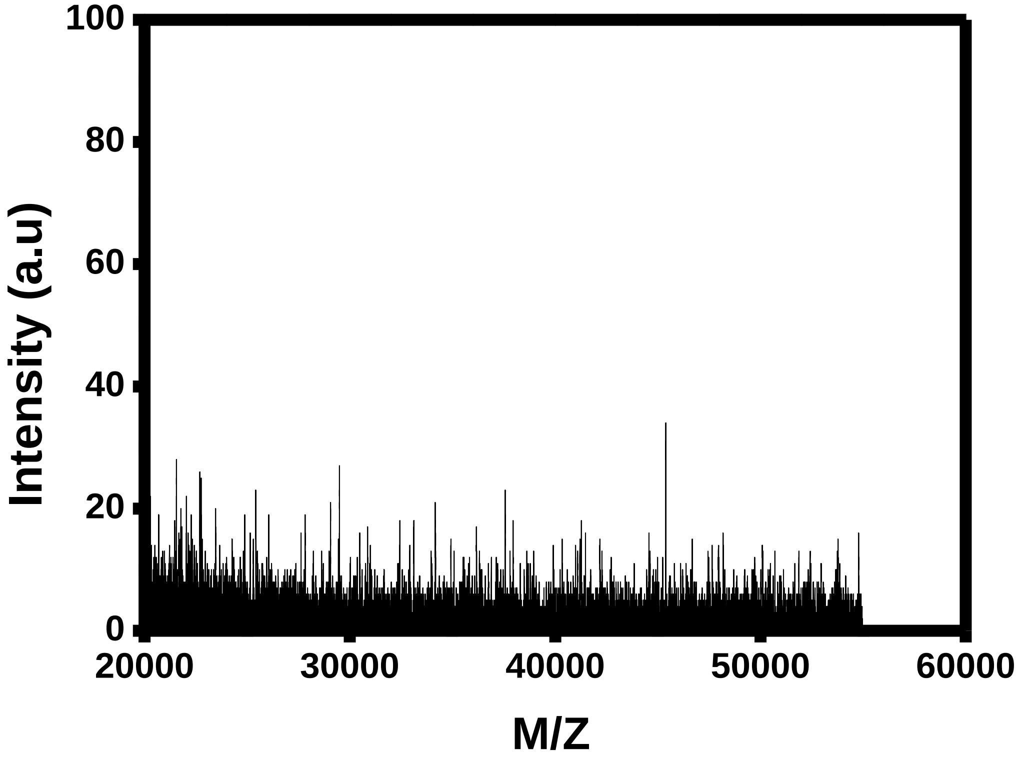


Figure S2: MALDI spectra of PAMAMOS with 2,5-dihydroxy benzoic acid as matrix.

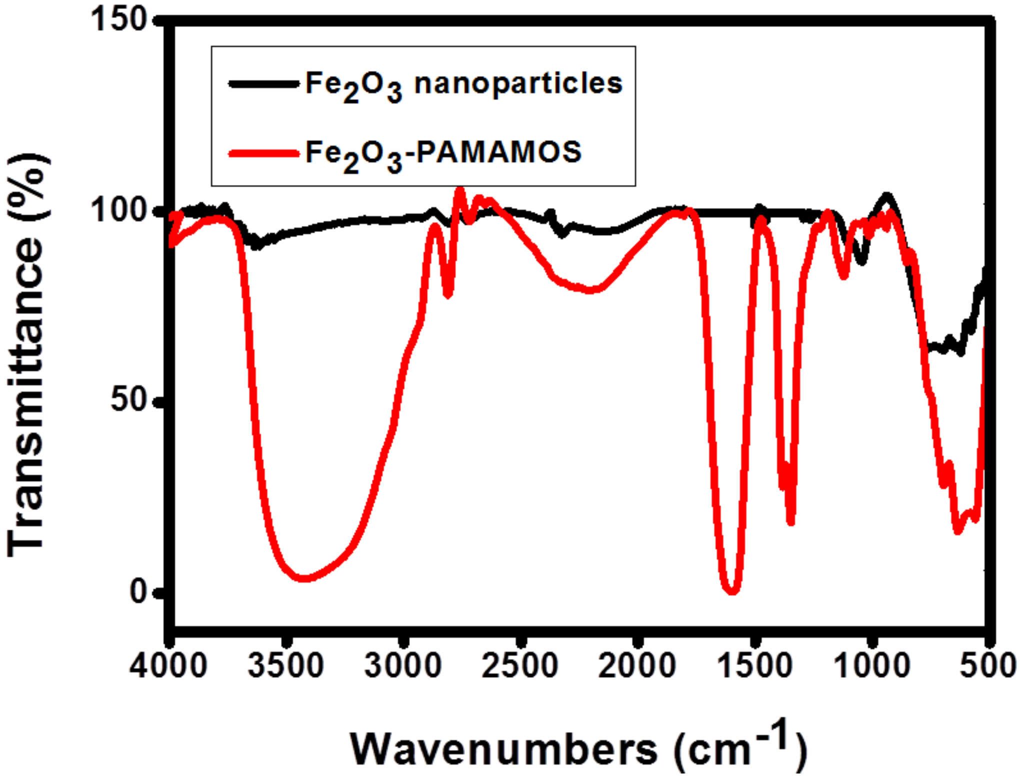


Figure S3: FT-IR spectrum of Fe_2O_3 nanoparticles and Fe_2O_3-PAMAMOS.

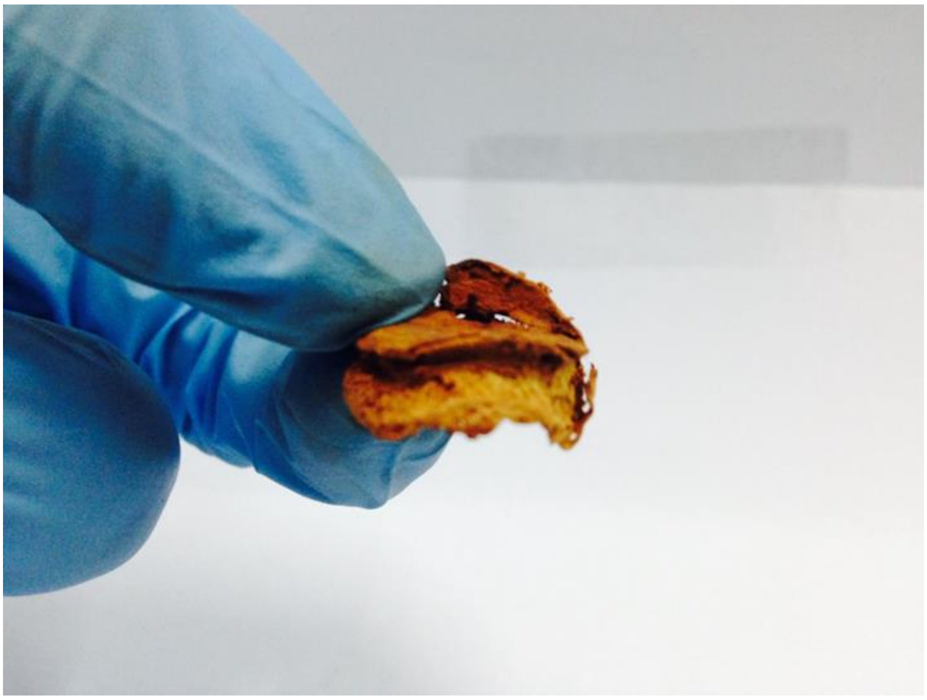


Figure S4: Photograph of aerogel.

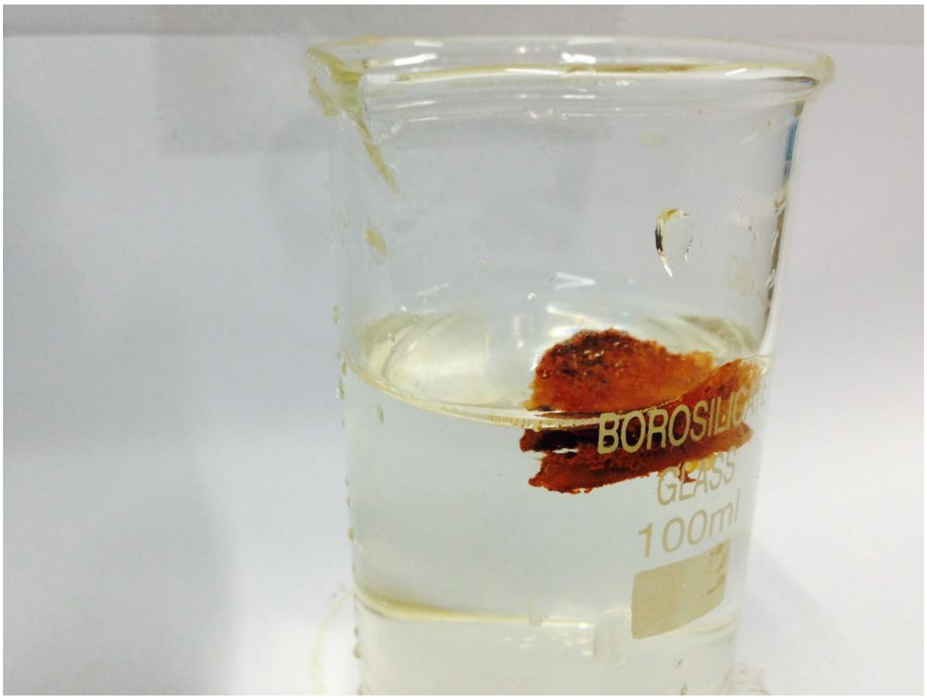


Figure S5: Photograph of floating of aerogel in water.

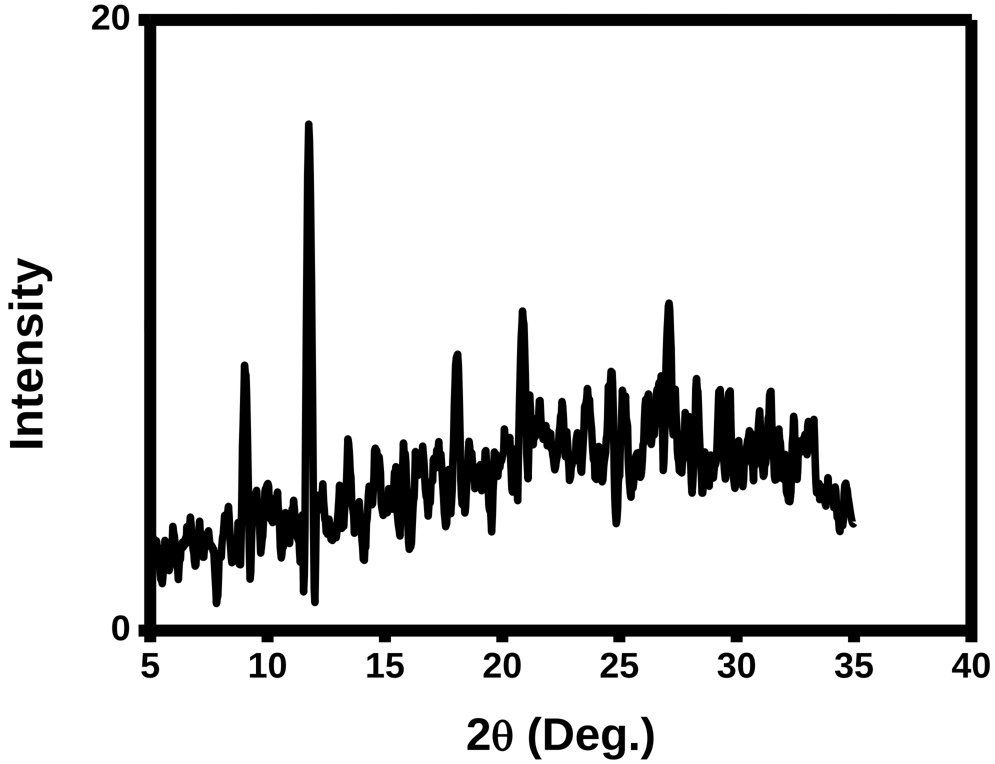
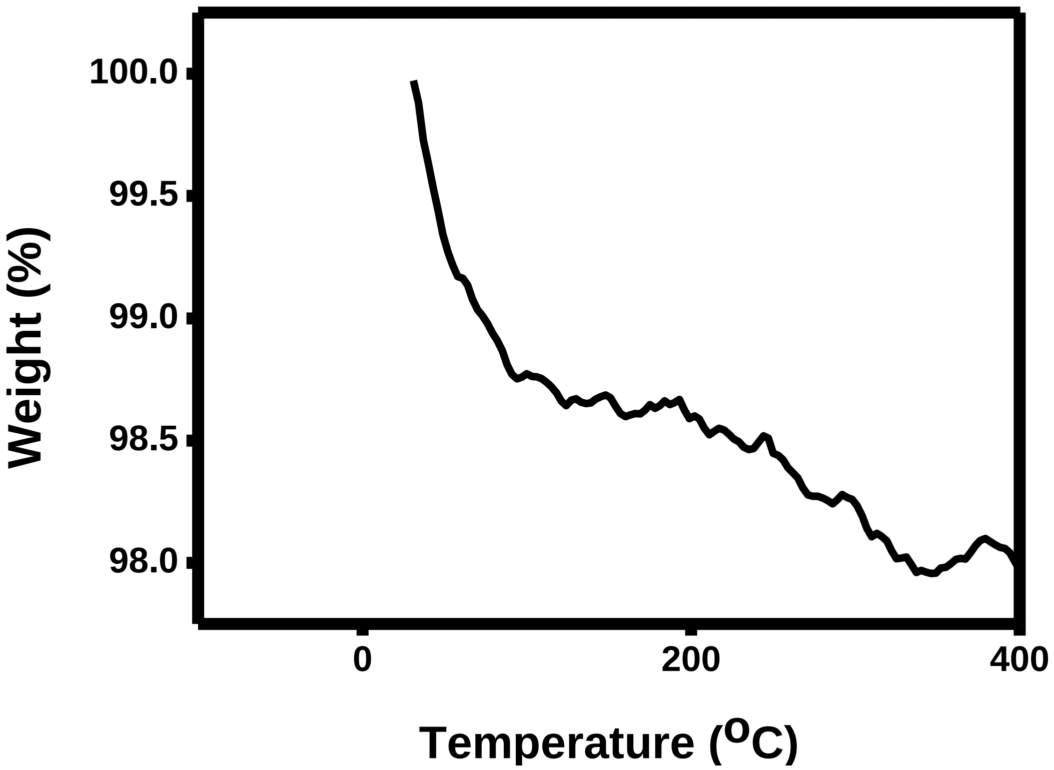


Figure S6: Powder XRD of Fe_2O_3 naoparticles.



100.0
99.5
99.0
98.5
98.0
Weight (%)
0
200
400
Temperature (oC)

Figure S7: TGA analysis of Fe_2O_3 nanoparticles.

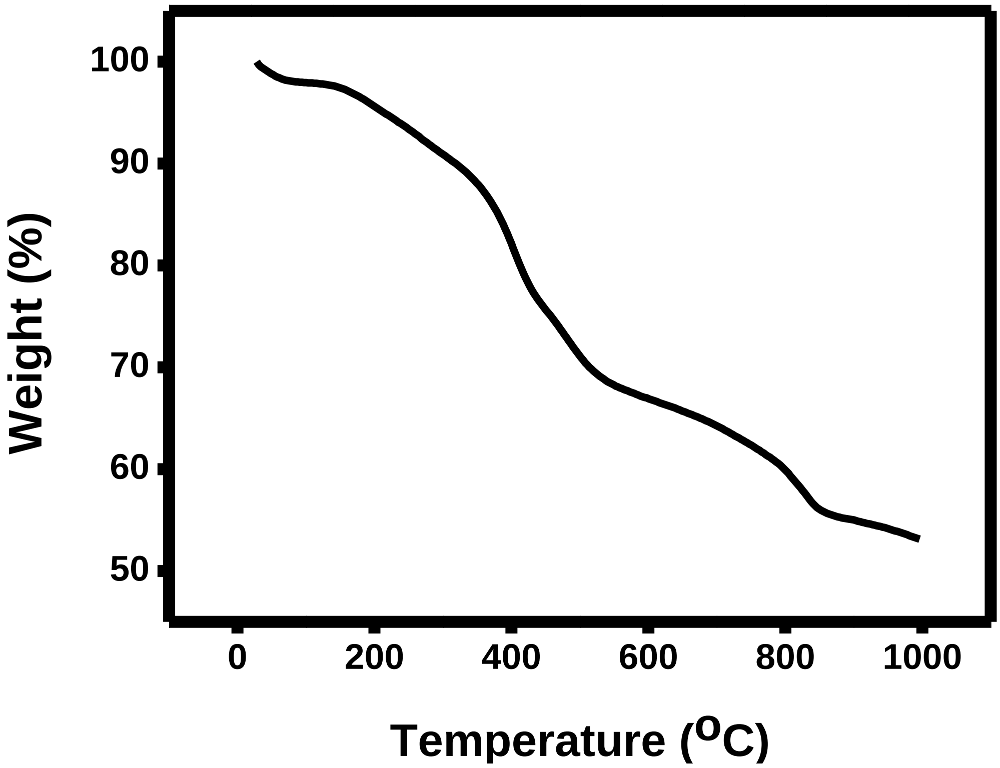


Figure S8: TGA analysis of Fe_2O_3-PAMAMOS nanoparticles.

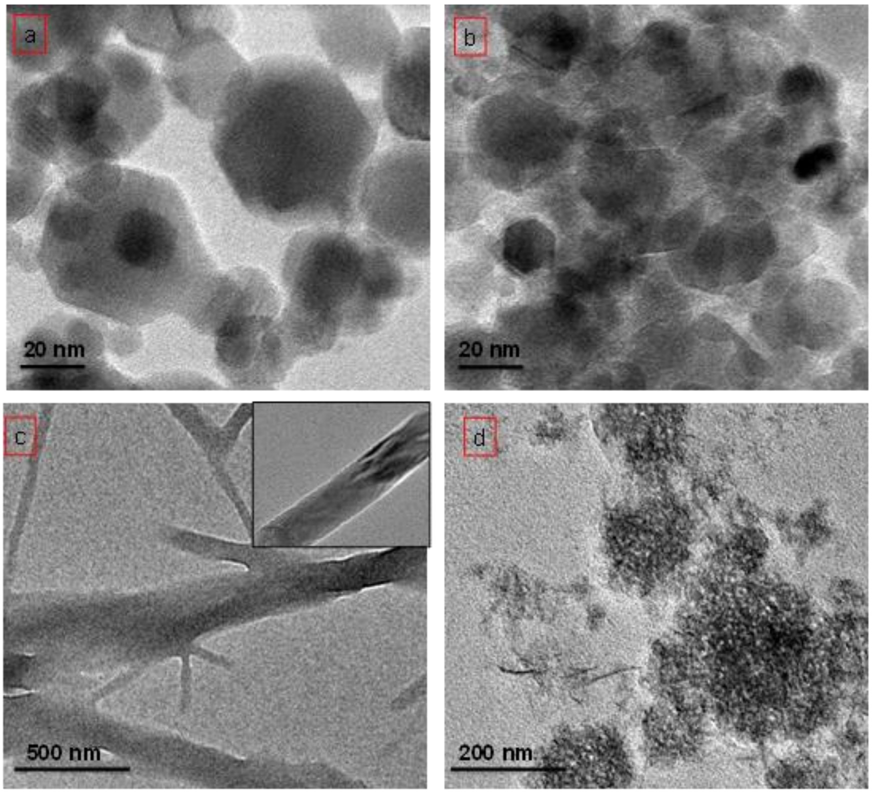


Figure S9: HR-TEM image of (a) Fe_2O_3 nanoparticles, (b) Fe_2O_3-PAMAMOS nanoparticles, (c) aerogel and (d) membrane

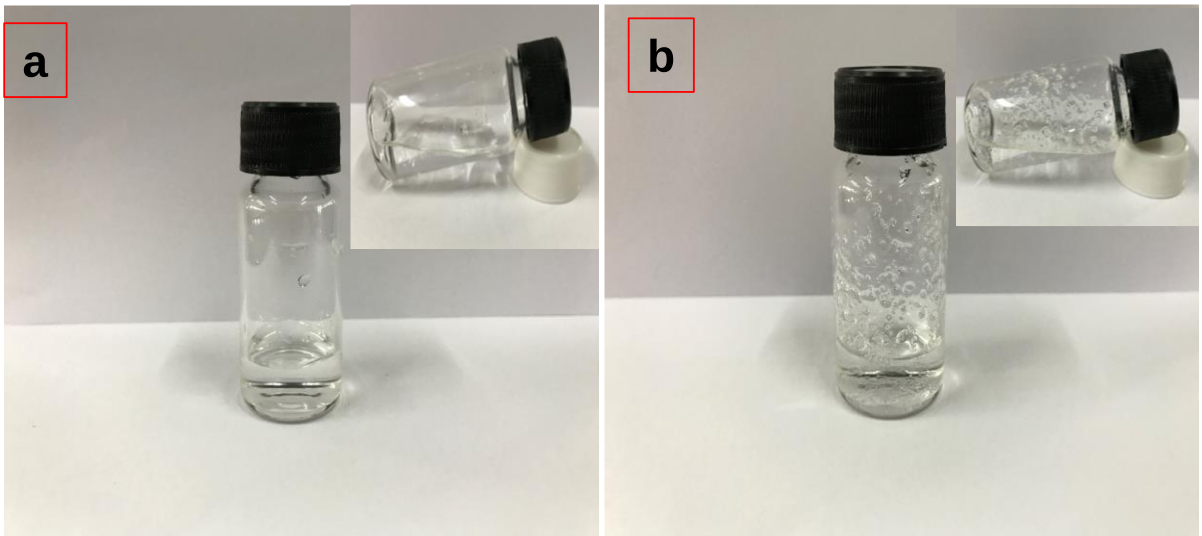


Figure S10: Photograph of control experiment; (a) PVA and formaldehyde are allowed to react in presence of HCl and H_2SO_4 in the absence of Fe_2O_3-PAMAMOS, resulting in no gelation;(b) PVA and formaldehyde are reacted with PAMAMOS in the absence of Fe_2O_3, again, resulting no gelation.

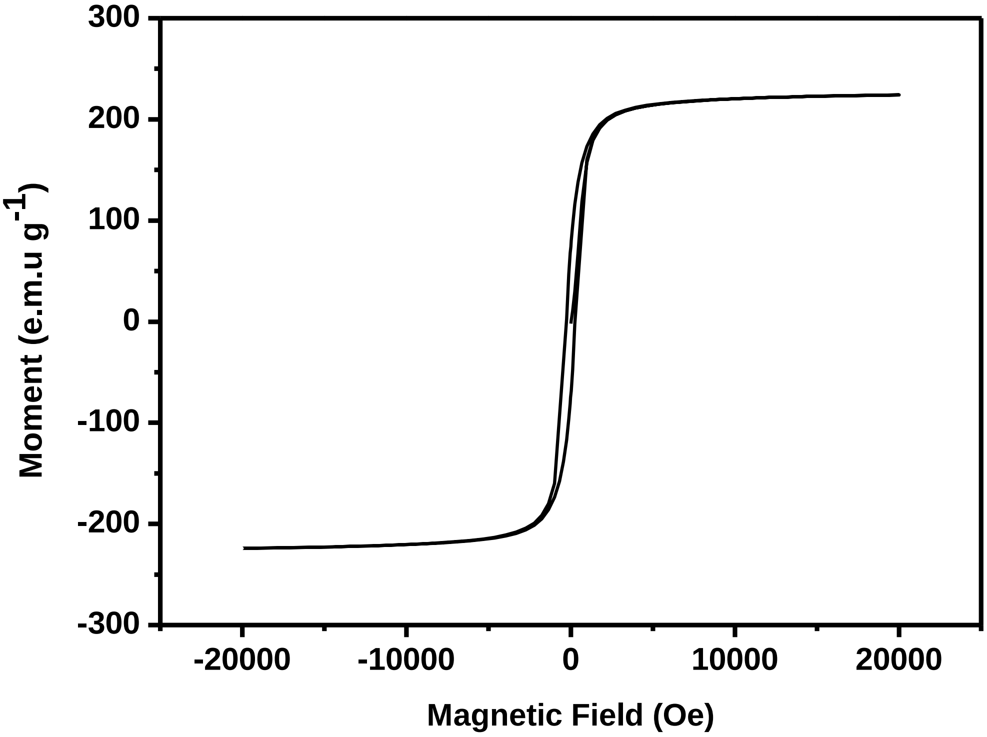


Figure S11: Magnetic moment versus magnetic field curve of Fe_2O_3 nanoparticles at 5K.

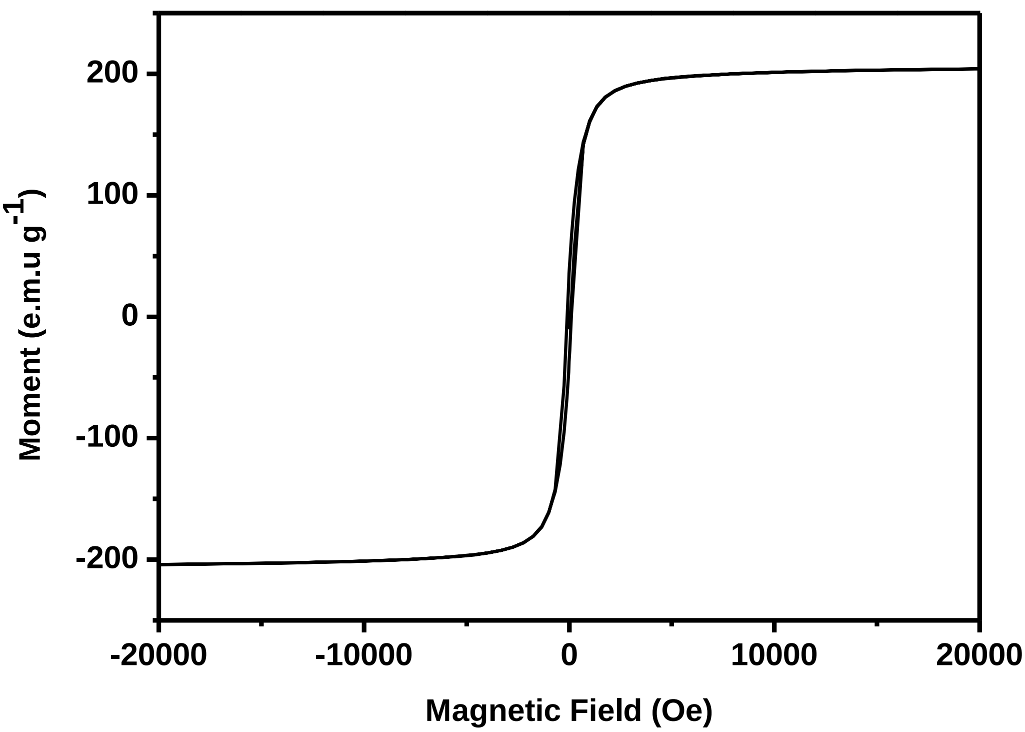


Figure S12: Magnetic moment versus magnetic field curve of Fe_2O_3 nanoparticles at 300K.

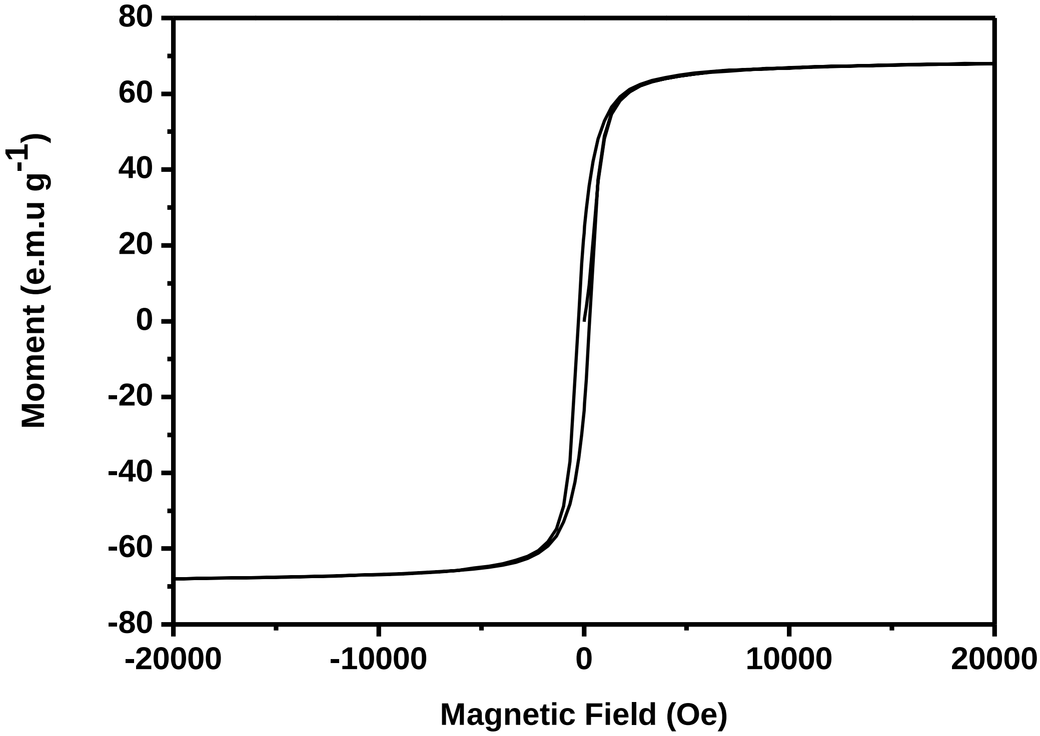


Figure S13: Magnetic moment versus magnetic field curve of Fe_2O_3-PAMAMOS nanoparticles at 5K.

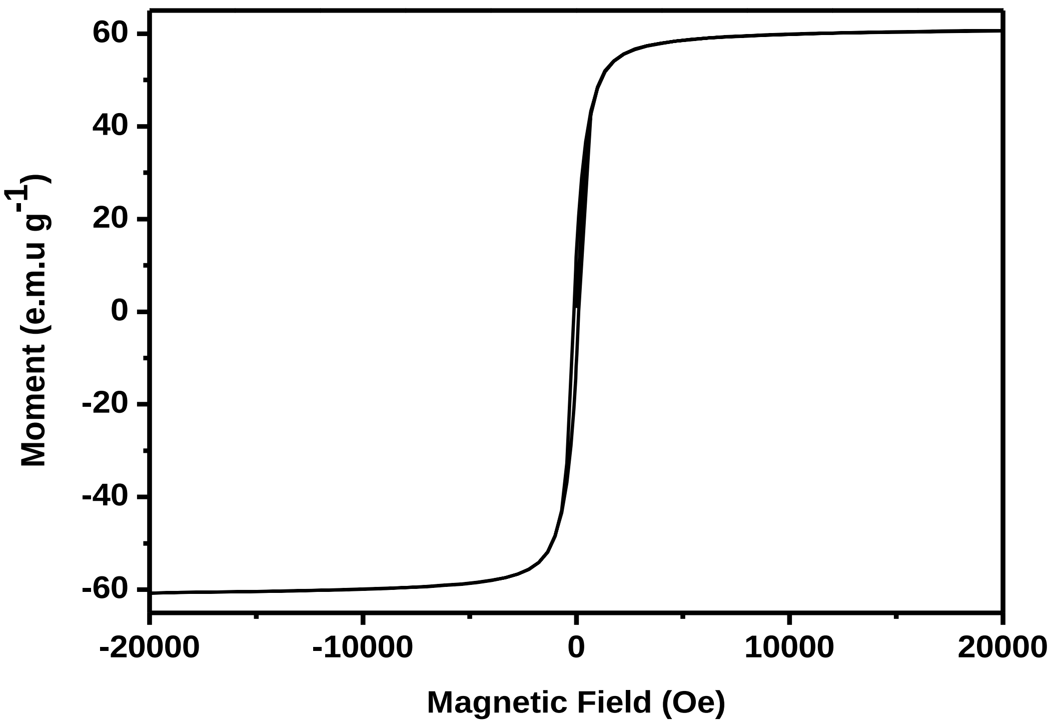


Figure S14: Magnetic moment versus magnetic field curve of Fe_2O_3-PAMAMOS nanoparticles at 300K.

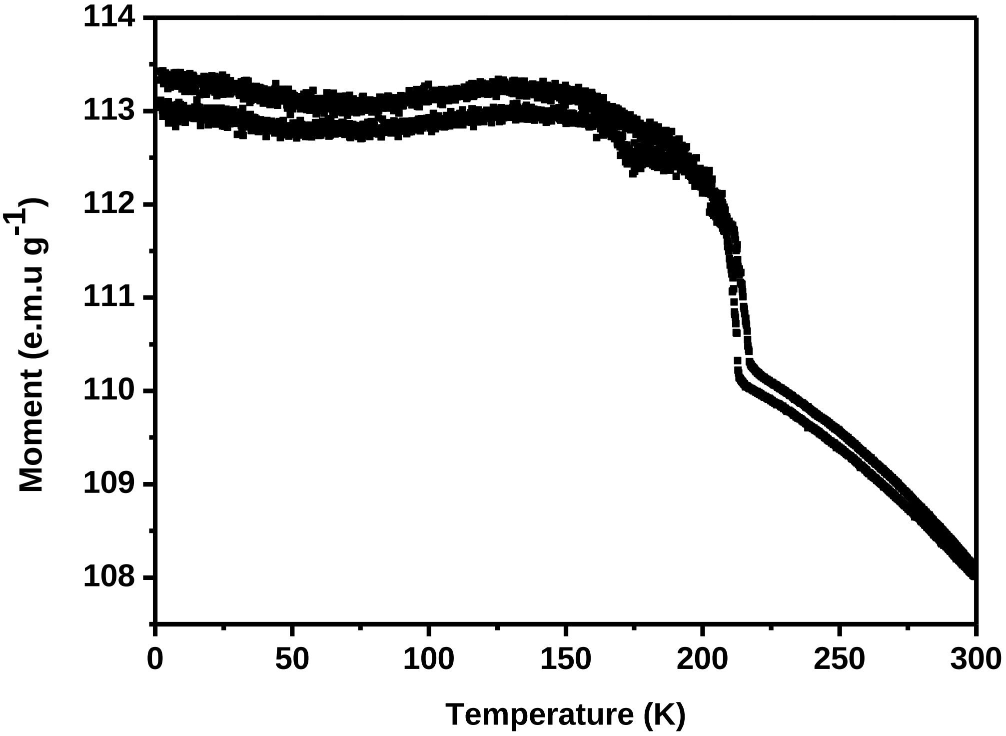


Figure S15: Magnetic moment versus temperature curve of Fe_2O_3 nanoparticles at constant magnetic field.

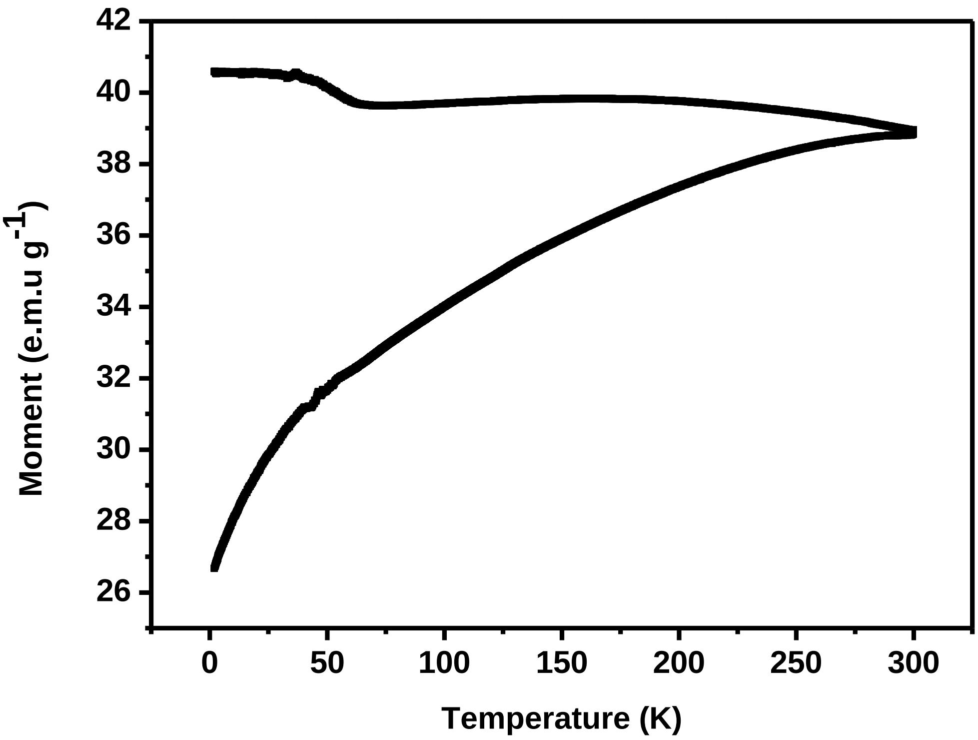


Figure S16: Magnetic moment versus temperature curve of Fe_2O_3–PAMAMOS nanoparticles at constant magnetic field.

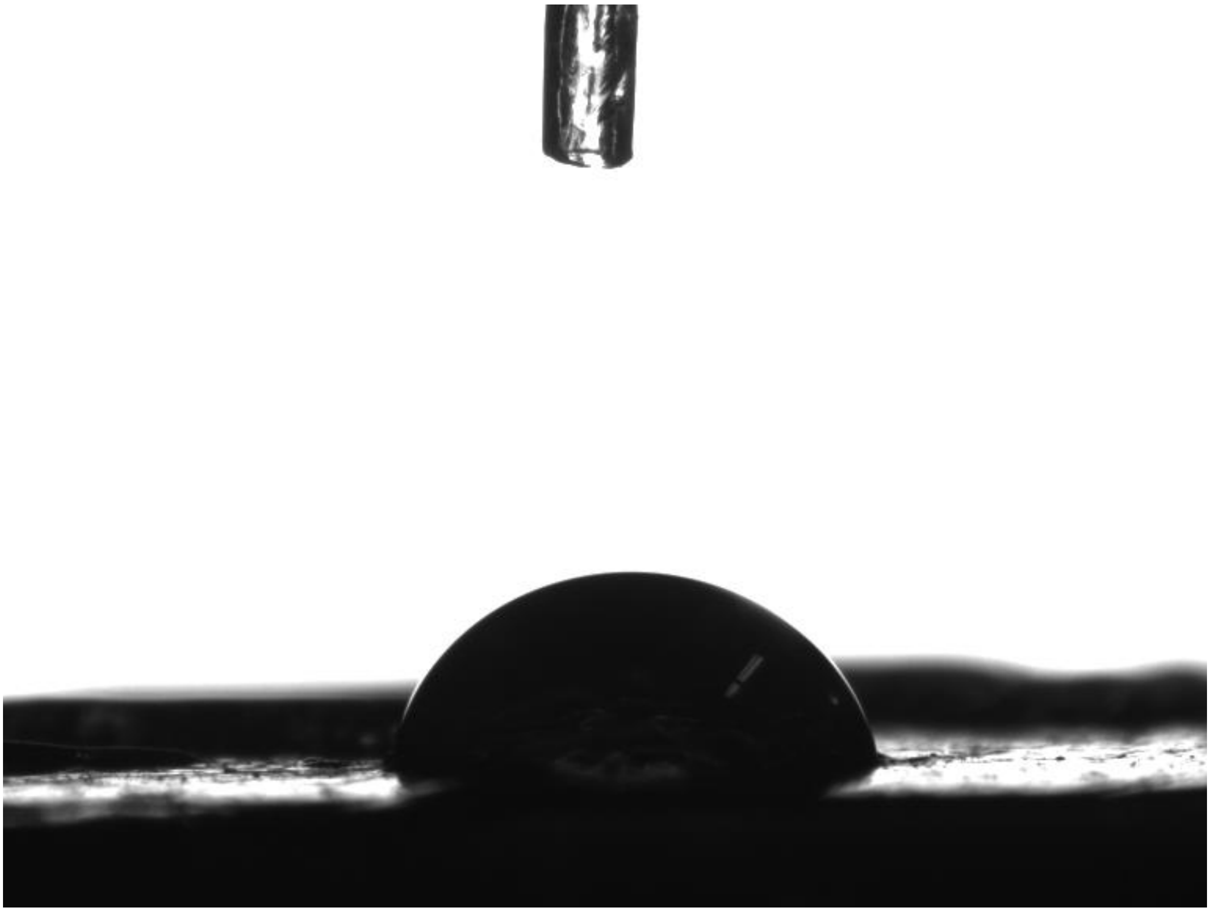


Figure S17: Water contact angle measurement of aerogel.

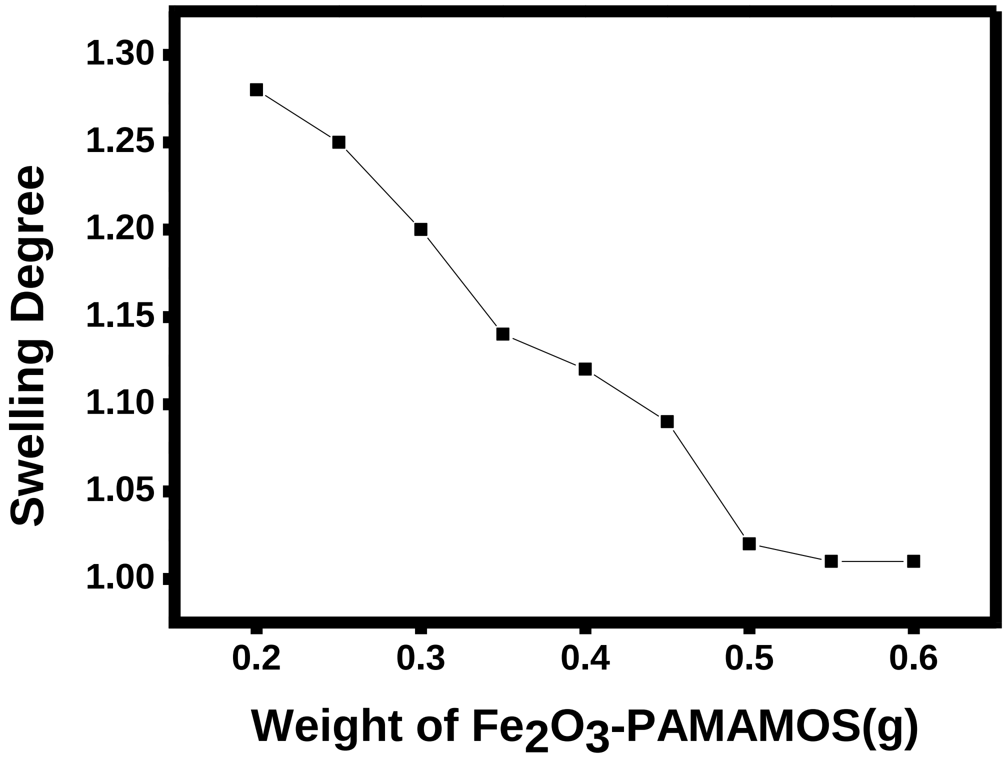


Figure S18: The swelling kinetics of the membrane versus weight of Fe_2O_3-PAMAMOS nanoparticles.

Table S1: Chemical stability parameter of membrane in different solvent.

Solvent	Stability
Hexane	Stable
Methanol	Stable
Chloroform	Stable
Dimethyl Sulfoxide	Stable
Isopropanol	Stable
Acetone	Stable
Tetrahydrofuran	Stable