Supporting Information

Efficient removal of methylene blue dye from an aqueous solution using silica nanoparticle crosslinked acrylamide hybrid hydrogels

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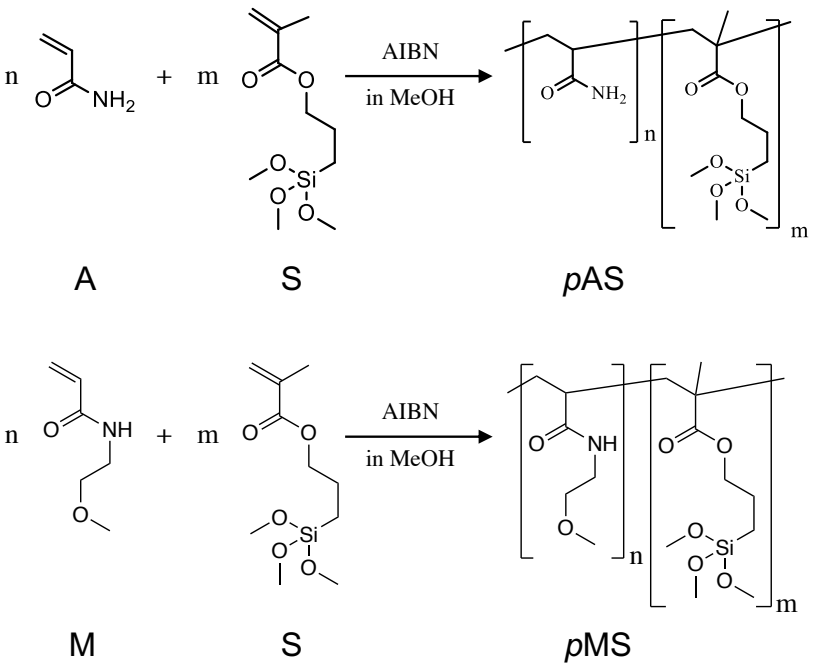
Scheme S1



Scheme S1 Schematic representation of the copolymerization reaction of M and A with S by free radical polymerization.

Figure S1

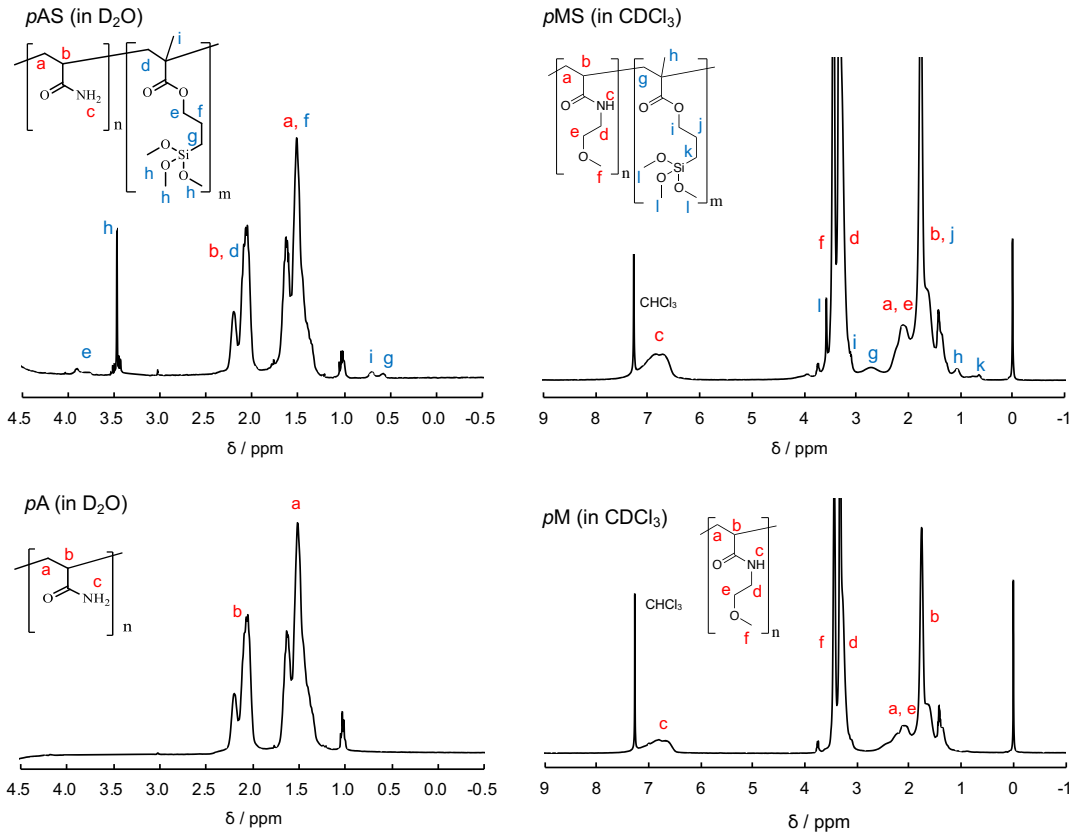


Fig. S1 ^{1}H NMR spectra of reactive copolymers (*p*AS and *p*MS) and homo polymers (*p*A and *p*M).

Figure S2

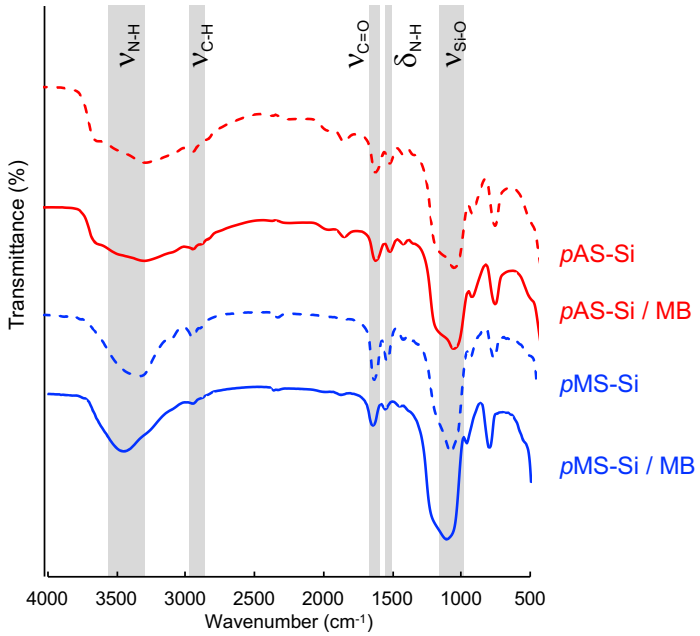


Fig. S2 FT-IR spectra of *p*MS-Si and *p*AS-Si before and after adsorption of MB dye.

Figure S3

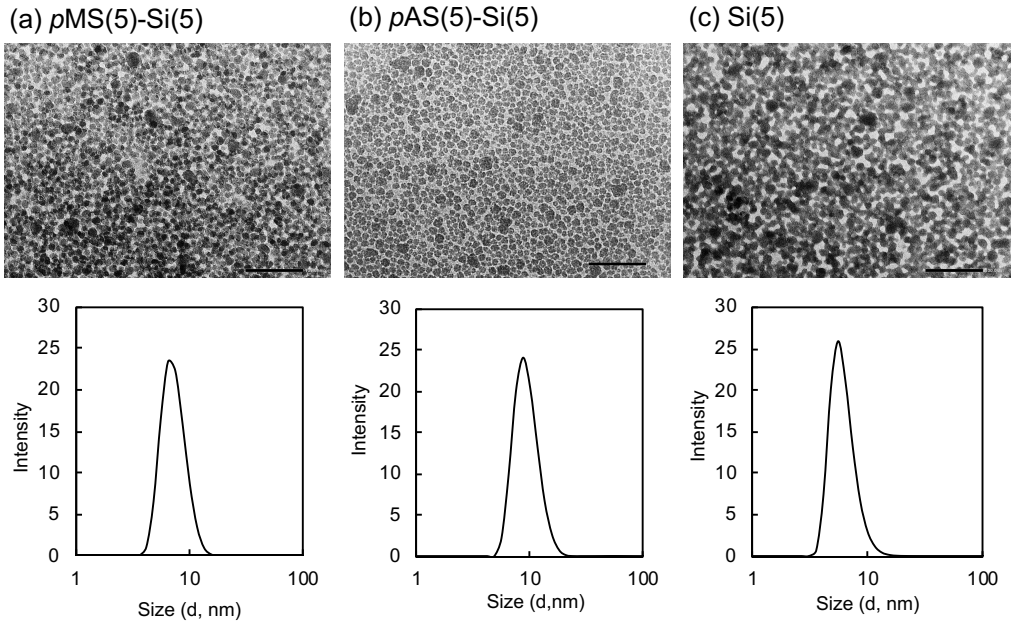


Fig. S3. TEM images and DLS of (a) *p*MS(5)-Si(5) and (b) *p*SA(5)-Si(5) hydrogels and (c) Si (5) only.

Figure S4

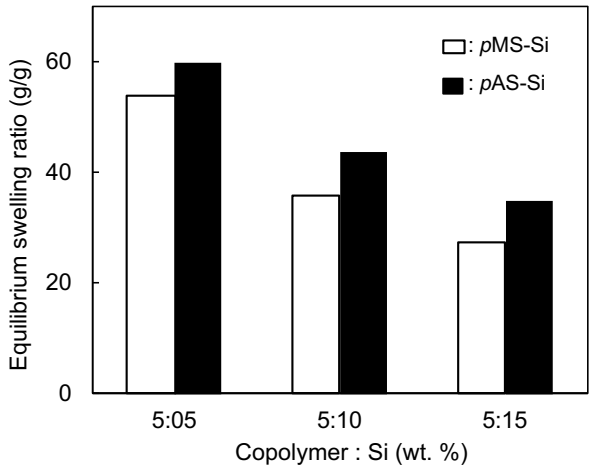


Fig. S4 Equilibrium swelling behavior of *p*MS-Si and *p*AS-Si hydrogels ratio (5:10-5:15) in water at 20 ˚C.

Figure S5

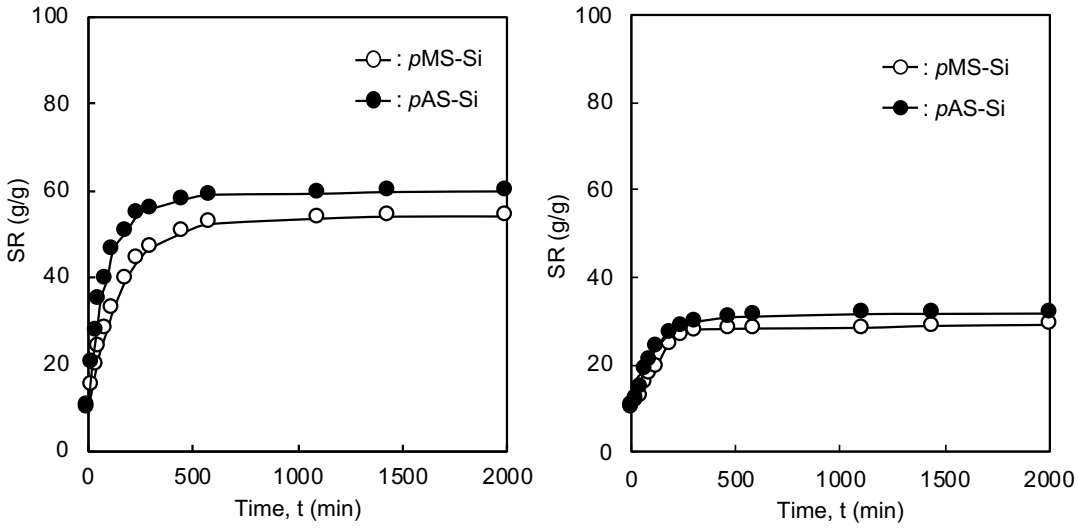


Fig.S5. Swelling behaviour of *p*MS-Si and *p*AS-Si hydrogels (a) in water and (b) in MB solution at 20 ˚C.

Figure S6

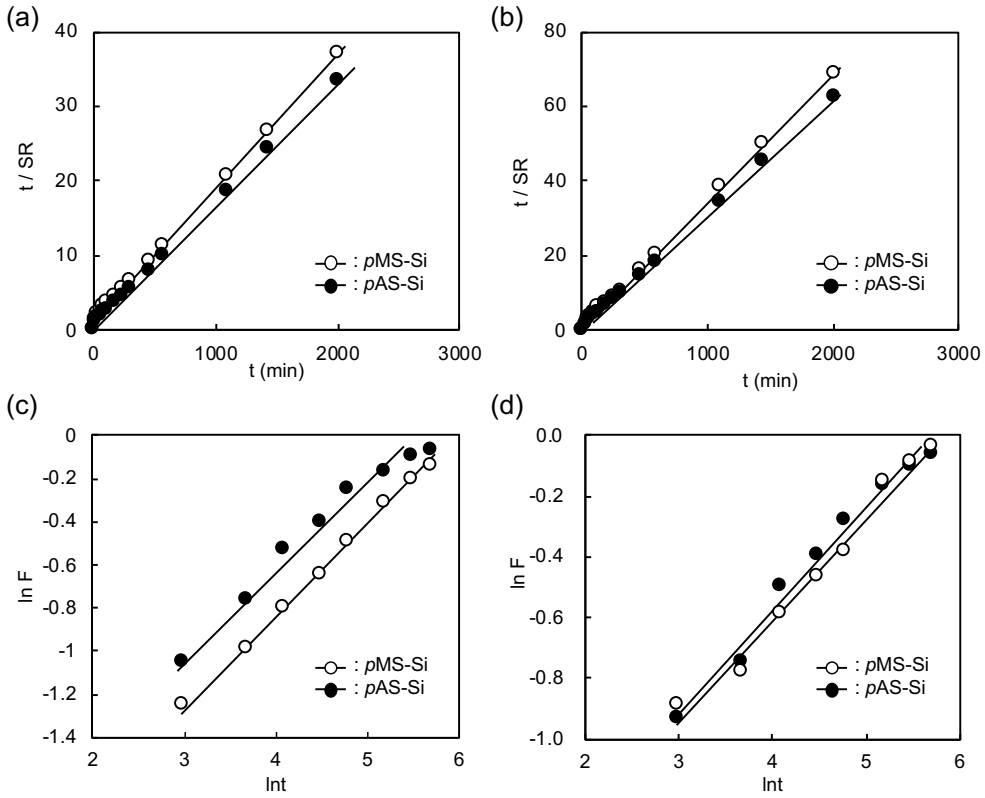


Fig S6 Plot of swelling kinetic models Fikian diffusion model (a) in water and (b) in aq. MB solution and Schott's second-order model for *p*MS-Si and *p*AS-Si hydrogels (c) in water and (d) in MB solution at 20 ˚C .

Table S1

Table S1 Swelling kinetic parameters of *p*MS-Si and *p*AS-Si hydrogels in water and aqueous solution of MB dye

Hydrogels	Fickian diffusion model				Schott's second-order kinetic model			
	n	k x 10^{-2}	D x 10^{-4} ($cm^2 s^{-1}$)	R^2	ESR_{exp}[a] ($g g^{-1}$)	ESR_{cal}[b] ($g g^{-1}$)	k x 10^{-4} ($g g^{-1}min^{-1}$)	R^2
*p*MS-Si (in water)	0.35	1.86	2.91	0.961	53.18	56.17	2.86	0.998
*p*AS-Si (in water)	0.43	1.57	3.03	0.958	59.75	60.97	4.98	0.996
*p*MS-Si (in MB aq.)	0.28	1.02	1.87	0.989	28.45	28.49	9.33	0.999
*p*AS-Si (in MB aq.)	0.12	1.17	1.35	0.978	31.94	32.57	9.25	0.999

[a] Experimental equilibrium swelling capacity
[b] Calculated equilibrium swelling capacity

Figure S7

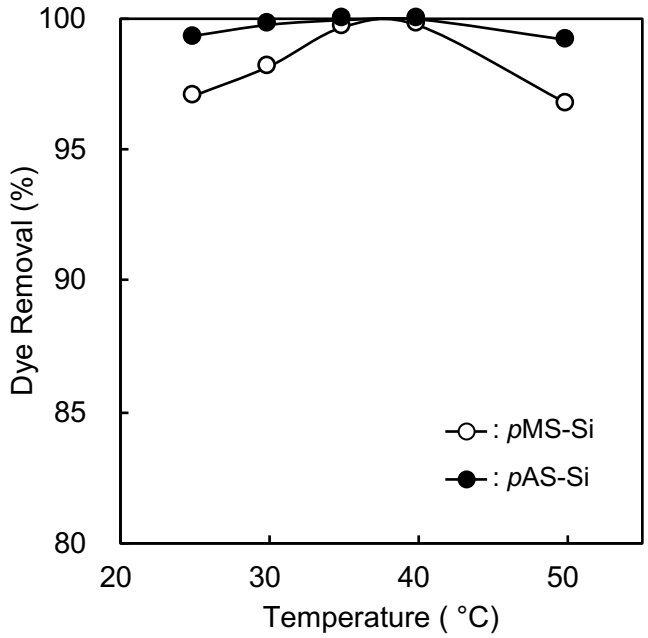


Fig. S7 Influence of temperature on adsorption of MB dye onto *p*MS-Si and *p*AS-Si hydrogels. (Initial MB concentration = 50 mg L^{-1}, Adsorbent amount = 80 mg mL^{-1}, pH = 9, Temperature = 25 °C).

Figure S8

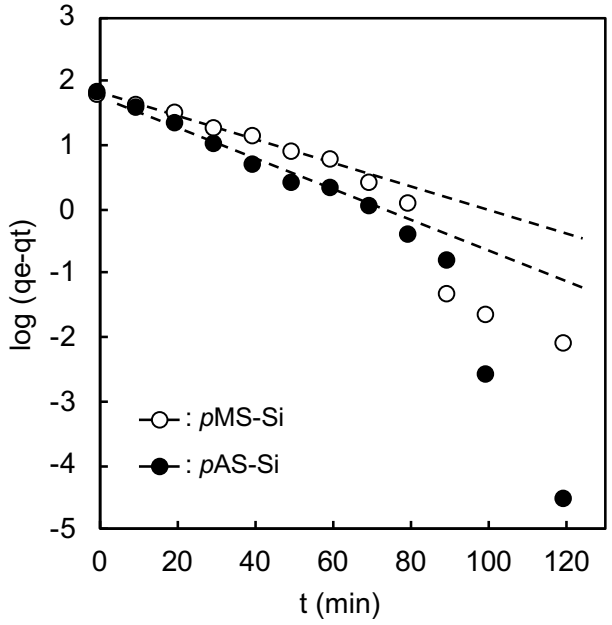


Fig. S8 Pseudo-first-order kinetic model for adsorbing MB dye onto *p*MS-Si and *p*AS-Si hydrogels. (Initial MB concentration = 50 mg L^{-1}, Adsorbent amount = 80 mg mL^{-1}, pH = 9, Temperature = 25 °C).

Figure S9

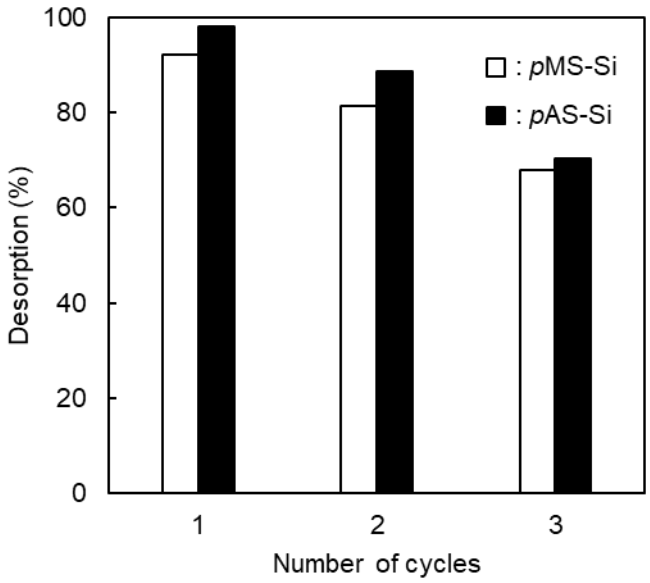


Fig. S9 Desorption studies of *p*MS-Si and *p*AS-Si hydrogels at different cycles.

Figure S10

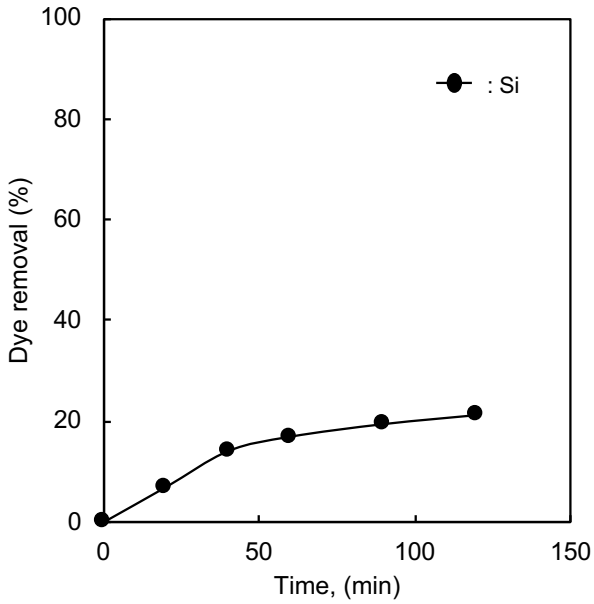


Fig. S10 Effect of contact time for adsorption of MB dye on Si. (MB concentration 50 mgL^{-1}, amount of Si 80 mg mL^{-1}, pH 9 and contact time 120 min, 25 ˚C).