Electronic Supplementary Information (ESI)

Bioinspired synthesis of poly(phenylboronic acid) microgels with high glucose selectivity at a physiological pH

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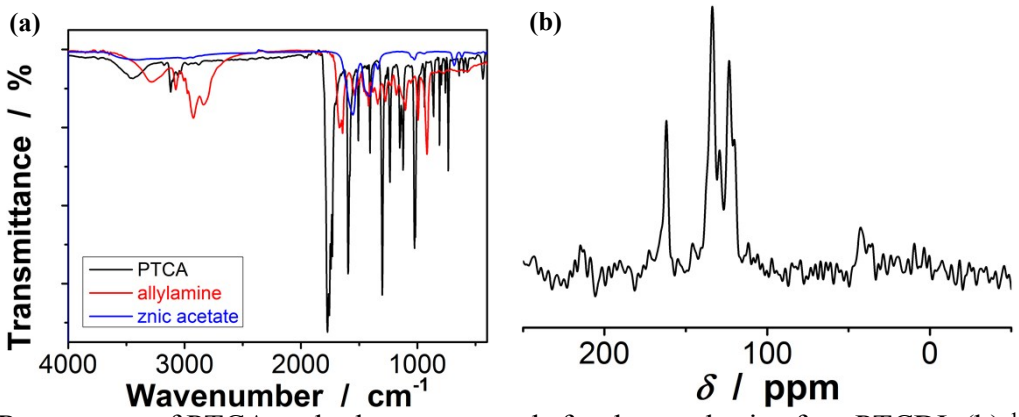

Fig. S1 (a) IR spectrum of PTCA and other compounds for the synthesis of pp-PTCDI. (b) ^{13}C CP-MAS NMR spectrum of pp-PTCDI.

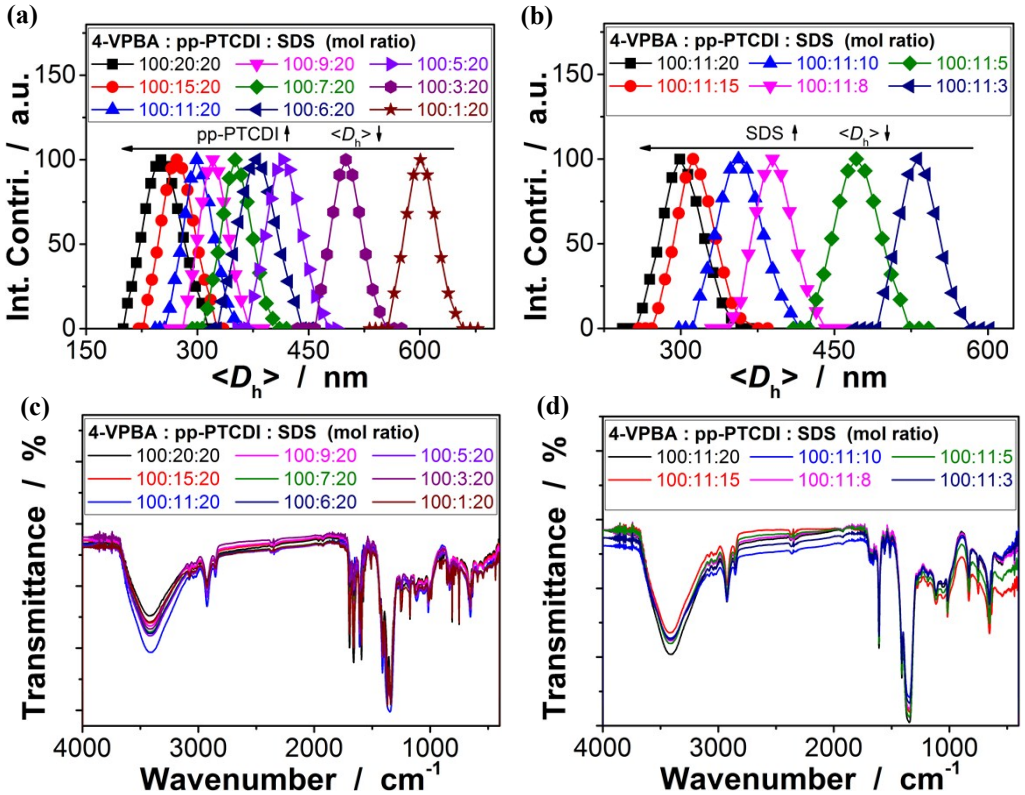

Fig. S2 DLS size distribution of the microgels synthesized with different mol ratios of 4-VPBA/pp-PTCDI/SDS. To show the effect of the feeding amount of (a) pp-PTCDI and (b) SDS, the feeding amount of 4-VPBA was set to 5.0×10^{-4} mol. All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C. (c,d) IR spectra of the samples.

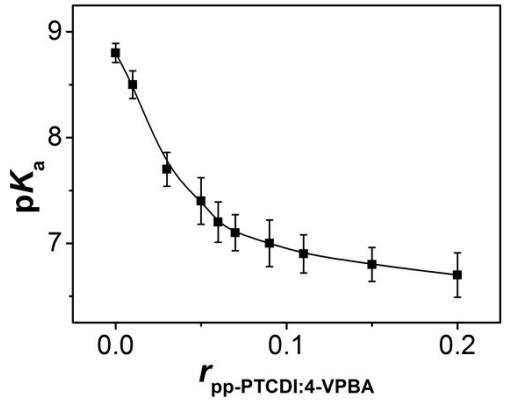

Fig. S3 The pK_a the PBA groups as a function of feeding molar ratio $r_{\text{pp-PTCDI:4-VPBA}}$ in the synthesis of the microgels. The p*K*a was measured by titration, and defined as the pH corresponding to the peak position on the ΔpH/ΔV-V_{NaOH} plot.

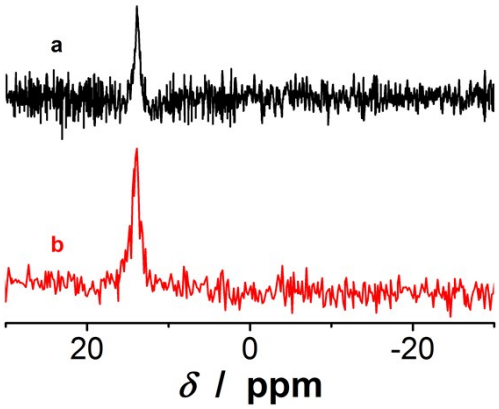

Fig. S4 ^{11}B NMR spectra of (a) a control sample synthesized with the 4-VPBA monomer using MBAAm (feeding molar ratio $r_{\text{MBAAm:4-VPBA}}$ = 11:100) as a crosslinker, and (b) a mixture of this control sample and pp-PTCDI upon simple mixing. All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

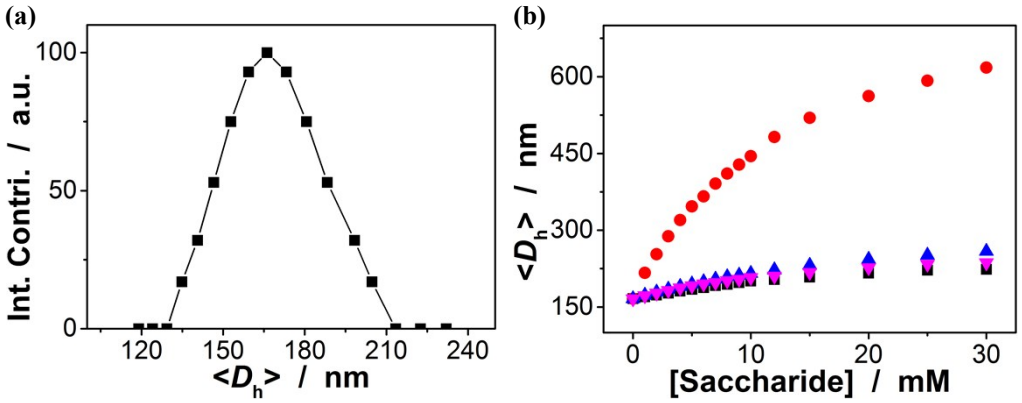

Fig. S5 (a) DLS size distribution of the control sample synthesized with the 4-VPBA monomer using MBAAm (feeding molar ratio $r_{\text{MBAAm:4-VPBA}}$ = 11:100) as a crosslinker. (b) Saccharide-dependent <D_h> values of the microgels dispersed in PBS with glucose (■), fructose (●), galactose (▲), and mannose (▼). DLS measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

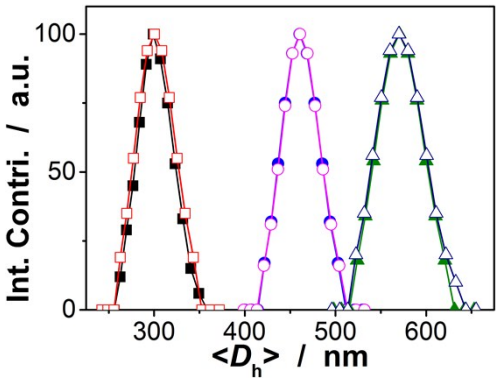

Fig. S6 DLS size distribution of the microgels (10.0 μg/mL) dispersed in the solutions with [Glu] = 0.0 mM (■,□), 5.0 mM (●,○), and 30.0 mM (▲,Δ), before (solid symbols) and after (open symbols) adding/removing Glu for twenty cycles. All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

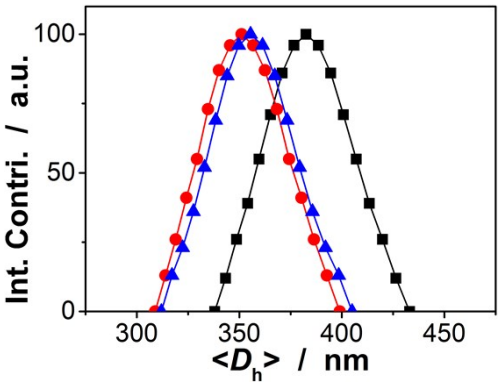

Fig. S7 DLS size distribution of the microgels (10.0 μg/mL) dispersed in the solutions with 30.0 mM fructose (■), galactose (●), and mannose (▲). All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

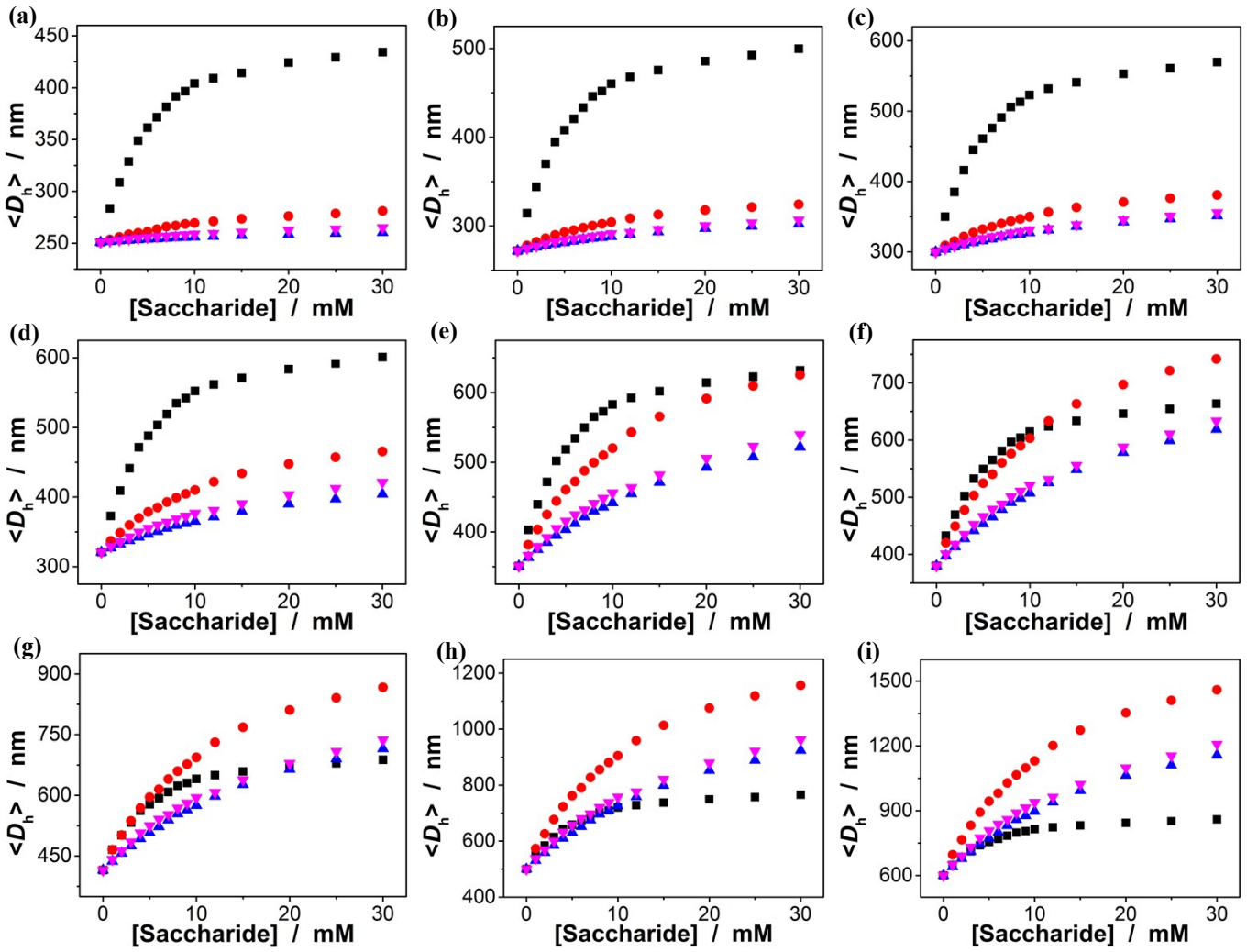

Fig. S8 Saccharide-dependent <D_h> values of the microgels dispersed in PBS with glucose (■), fructose (●), galactose (▲), and mannose (▼), showing the impact of the feeding molar ratio $r_{pp\text{-}PTCDI:4\text{-}VPBA}$ in the synthesis of the microgels: (a) 0.20; (b) 0.15; (c) 0.11; (d) 0.09; (e) 0.07; (f) 0.06; (g) 0.05; (h) 0.03; and (i) 0.01. DLS measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

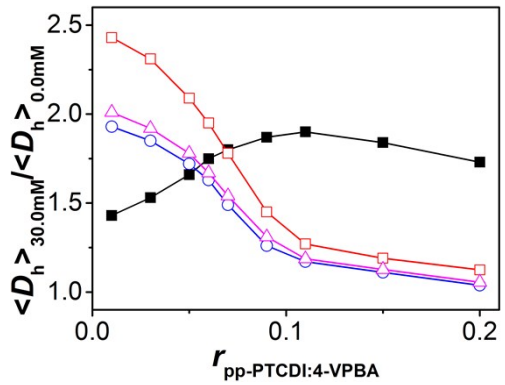

Fig. S9 The swelling ratio, $<D_h>_{30.0mM}/<D_h>_{0.0mM}$, as a function of feeding molar ratio $r_{pp\text{-}PTCDI:4\text{-}VPBA}$ of the microgels. DLS measurements were made in 5.0 mM PBS with glucose (■), fructose (□), galactose (○), and mannose (Δ) of pH = 7.4 at 25.0 °C.

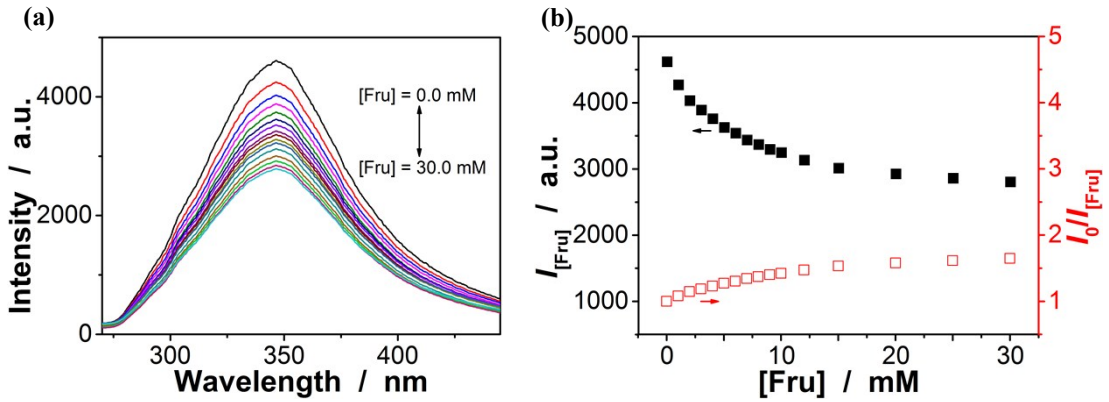

Fig. S10 [Fru]-dependent (a) PL spectra and (b) $I_{[Fru]}$ and $I_0/I_{[Fru]}$ values. All measurements were made on the microgel dispersion (10.0 μg/mL) at 25.0 °C.

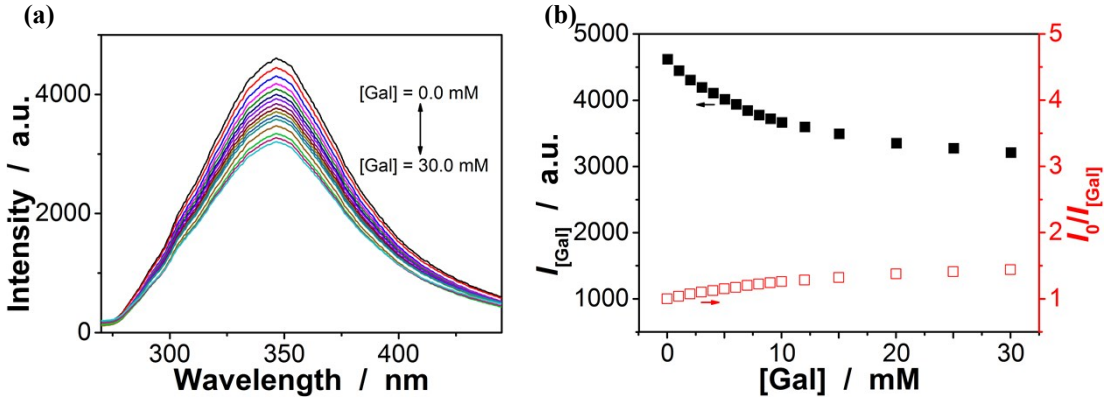

Fig. S11 [Gal]-dependent (a) PL spectra and (b) $I_{[Gal]}$ and $I_0/I_{[Gal]}$ values. All measurements were made on the microgel dispersion (10.0 μg/mL) at 25.0 °C.

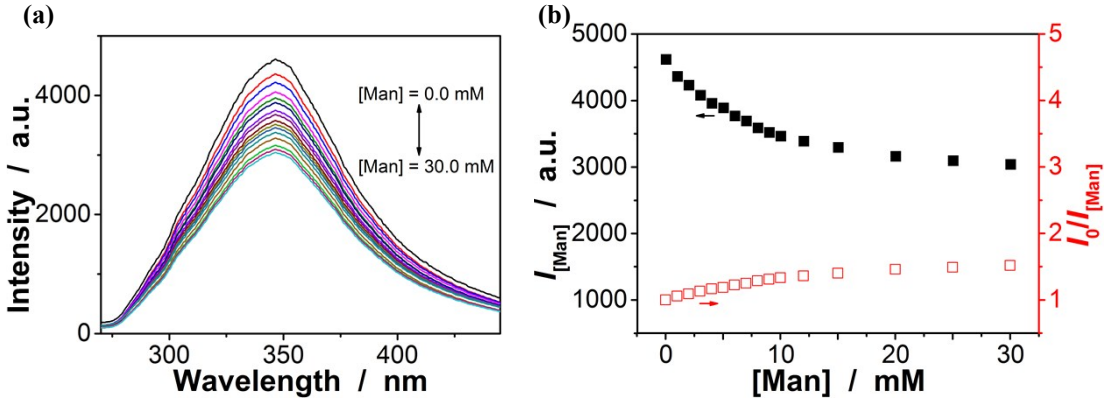

Fig. S12 [Man]-dependent (a) PL spectra and (b) $I_{[Man]}$ and $I_0/I_{[Man]}$ values. All measurements were made on the microgel dispersion (10.0 μg/mL) at 25.0 °C.

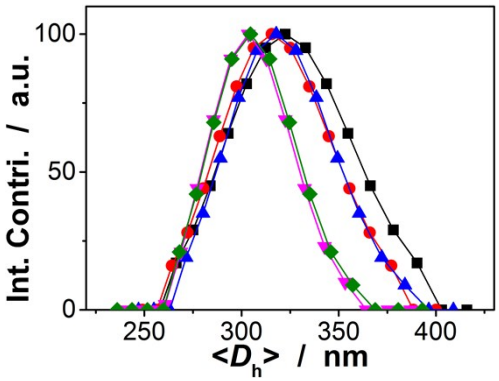

Fig. S13 DLS size distribution of the microgels in the presence of absorbed dextran (M_r ~ 6,000) (■), dextran (M_r ~ 40,000) (●), dextran (M_r ~ 100,000) (▲), RNase B (▼) and HSA (♦). All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

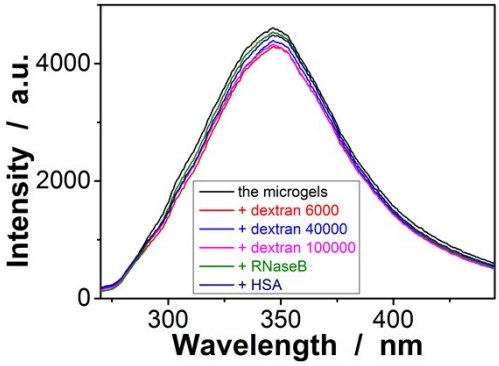

Fig. S14 PL spectra of the microgels in the presence of absorbed dextran (M_r ~ 6,000), dextran (M_r ~ 40,000), dextran (M_r ~ 100,000), RNase B and HSA. All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.

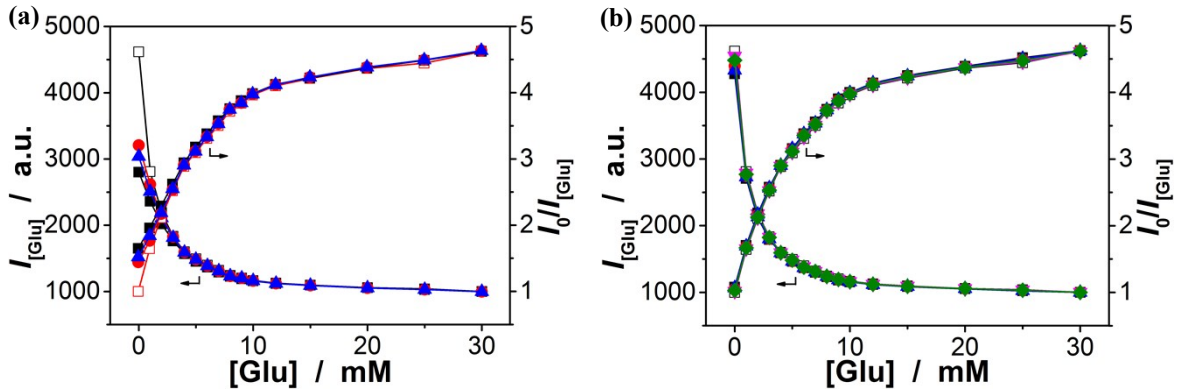

Fig. S15 [Glu]-dependent $I_{[Glu]}$ and $I_0/I_{[Glu]}$ values of SPBA microgels dispersed in PBS with in the presence of (a) 30.0 mM of fructose (■), mannose (●), or galactose (▲), and (b) absorbed dextran (M_r ~ 6,000) (■), dextran (M_r ~ 40,000) (●), dextran (M_r ~ 100,000) (▲), RNase B (▼) and HSA (♦). The results in the absence of those non-glucose constituents (□) are given for comparison. All measurements were made in 5.0 mM PBS of pH = 7.4 at 25.0 °C.