**Cover Page for Supporting Information**

**Manuscript title:** The investigation of the specific behavior for the cationic block structure and its excellent flocculation performance in high turbidity water treatment

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**Contents:**

**Text S1.** Analytical methods for $K_M$, $R_p$ and $C_v$.

The dialysis and conductometric titration methods were used to determine the $K_M$ and $R_p$, and the $K_M$ was calculated by the following Formula (1):

$$K_M = \frac{[NaPAA *** ATAC]}{[NaPAA]_f[ATAC]_f}$$

(1)
In Formula (1), $[NaPAA\cdots ATAC]$ referred to the concentration of the association of NaPAA and ATAC, $[NaPAA]_f$ and $[ATAC]_f$ were the free concentration when the dialysis kept balance. Meanwhile, the free concentration of NaPAA and ATAC was measured by conductometric titration method. Prior to the determination of polymerization rate ($R_p$), the monomer conversion rate was controlled to less than 10%, and the $R_p$ was calculated by the following Formula (2):

$$R_p = k \times [M]$$  \hspace{0.5cm} (2)

In Formula (2), $[M]$ referred to the initial concentration of monomer, and $k$ was the slope of the $Y_i = \ln[1/(1-C_i)]$ plot (a fitting straight line), where $C_i$ is the monomer conversion ($C$) with a given reaction time at 2 min, 4 min, 6 min, 8 min and 10 min, and it was determined by gravimetric method.$^1$

$$Conversion = \frac{m_0 \cdot m_2}{m \cdot m_1}$$  \hspace{0.5cm} (3)

where $m$ is the total weight of the monomers (AM and ATAC) for the copolymerization, $m_0$ is the weight of the obtained product after copolymerization, $m_1$ is the copolymerization weight used for purification, and $m_2$ is the copolymerization weight after purification.

**Text S2. Analytical method for Fractal dimension ($D_f$)**

Fractal dimension ($D_f$) could be determined by the light scattering method from the negative slope of log-log plot by a well-known power-law relation:$^{2,3}$

$$I \propto Q^D$$  \hspace{0.5cm} (4)

where $I$ is the light intensity, and $Q$ is the scatter vector which can be given according to the following equation:

$$\frac{4\pi n \sin(\theta/2)}{\lambda}$$  \hspace{0.5cm} (5)

where $\lambda$ is the wavelength of radiation in vacuum (635 nm in this work), $n$ is the refractive index of the dispersion medium (1.33 for water), and $\theta$ is the scattering angle, respectively.

**References**
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3  J. Greenwood, T. Rainey and W. O. S. Doherty, *Journal of Colloid & Interface Science*, 2007, *306*, 66-71.