Supplementary data for [Phase Transition of a Single Protein-like Copolymer Chain]

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S1. Comparison of the logarithm of the density of state (DOS) function $\ln g(E)$ for PLCs with different sizes.

Fig. S1 Logarithm of the DOS functions $\ln g(E)$ as a function of the average energy $E/N$ for chains of length $N = 32$, 64, 128 and 256 with different block length $m$. (a ~ d) HP-PLC; (e ~ h) AB-PLC.
S2. Comparison of the average specific heat function $C_V(T)/N$ for the PLCs with different sizes.

Fig. S2 Average specific heat function $C_V(T)/N$ as a function of the reduced temperature $T$ for chains of length $N = 32, 64, 128$ and $256$ with different block length $m$. (a ~ d) HP-PLC; (e ~ h) AB-PLC.
S3. Comparison of the potential energy surface (PES) for the PLCs with different block lengths.

**HP:**

Fig. S3 Potential energy surface spanned by the radius of gyration of the two components for HP and AB PLCs respectively ($N = 256$). The energy level is mapped to the colour scale for a distinction. An inset chart in AB-PES magnifies the low $R_g$ region.