Supplementary Information for

Single-molecule imaging reveals topological isomer-dependent diffusion by 4-armed star and dicyclic 8-shaped polymers

Satoshi Habuchi**†, Susumu Fujiwara‡, Takuya Yamamoto, Yasuyuki Tezuka**‡

† Biological and Environmental Sciences and Engineering Division, King Abdullah University of Science and Technology, P.O. Box 4700 KAUST, Thuwal 239500-6900, Kingdom of Saudi Arabia.

‡ Department of Organic and Polymeric Materials, Tokyo Institute of Technology, 2-12-1 O-okayama, Meguro-ku, Tokyo 152-8552, Japan.

Supporting Text

Figure S1

Movie S1.avi: An example of fluorescence images of 1 in the linear poly(THF) matrix

Movie S2.avi: An example of fluorescence images of 2a+2b in the linear poly(THF) matrix
Calculation of gyration radius

Gyration radius ($R_g$) of a flexible polymer chain which has $N$ Kuhn monomer and Kuhn length of $b$ can be calculated by equation S12 and S13.\(^1\)

\[
\langle R_g^2 \rangle = \left( \frac{N}{f} \right) b^2 \left( \frac{3 - 2/f}{f - \text{arm star polymer}} \right) 
\]

\[
\langle R_g^2 \rangle = \frac{N b^2}{12} \quad \text{(cyclic polymer)} \tag{S2}
\]

Assuming the physical properties of poly(THF) are similar to those of poly(ethylene oxide), $b$ of poly(THF) is estimated to be $b = 1.1$ nm. The Kuhn monomer numbers are 76, 58 (per ring), and 23 for 1, 2a+2b, and linear poly(THF), respectively. Therefore, the gyration radii of 1, 2a+2b, and linear poly(THF) are calculated to be 3.1 nm, 2.4 nm (per ring), and 2.2 nm, respectively.
Figure S1. (top) Experimentally obtained cumulative distribution functions (CDFs, \(\Delta t = 7.5 \text{–} 75\) ms) in the form of \(1-P\) (solid lines) for 2a+2b. Dashed lines show fittings with Eq. 2. (bottom) CDF coefficients at different time lags determined by the single Gaussian distribution model using Eq. 2. The solid line shows a linear fitting.

Supporting references