

Supplementary Information for

Growth of filament under macromolecular confinement by scaling theory

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Materials

Polyacrylamide with $M_w = 5.1 \times 10^6$ g/mol (determined by laser light scattering), Tris base (tris (hydroxymethyl) aminomethane) and EDTA (ethylenediamine tetra acetic acid) were purchased from Sigma-Aldrich Co., LTD. Acetic acid and magnesium acetate $[Mg(Ac)_2]$ were purchased from Beijing Chemical Reagent Company. The stock buffer solution for DNA assembly contains 400 mM Tris base, 125 mM $Mg(Ac)_2$ and the pH is adjusted to 8.3 with HAc. It is diluted by 10 times before use. Each DNA strand was resuspended separately and stored in 1× TE buffer (10mM Tris-acetate, 1 mM EDTA, pH =8.3) at a 25 uM stock concentration. The Alex 532 labeled DNA strand was resuspended in the same buffer but at a 1.0 uM stock concentration.

Assembly of DNA nanotube

To prevent the absorption of analyte on the glass substrate, the cover glass was chemically coated with PAM beforehand by following a known procedure. The final concentration of each DNA strand is 100 nM in a buffer containing 40 mM Tris base, 12.5mM $Mg(Ac)_2$, 1 mM EDTA and known amount of PAM. The solution was heated at 95 °C for 5 min and then annealed to 45 °C. After 5 min, the solution was quenched to 25 °C for the assembly to start. This moment is set as time zero. The assembly was observed by Total Internal Reflection Fluorescence Microscopy (TIRFM). The excitation laser beam (CNI, 532nm) was introduced to the sample surface from the bottom of the substrate by an oil-immersion objective lens (100×, numerical aperture = 1.45). The fluorescence images were recorded by an electron multiplying charge-coupled device camera (Andor DV887 EMCCD) and analyzed by Image J software.

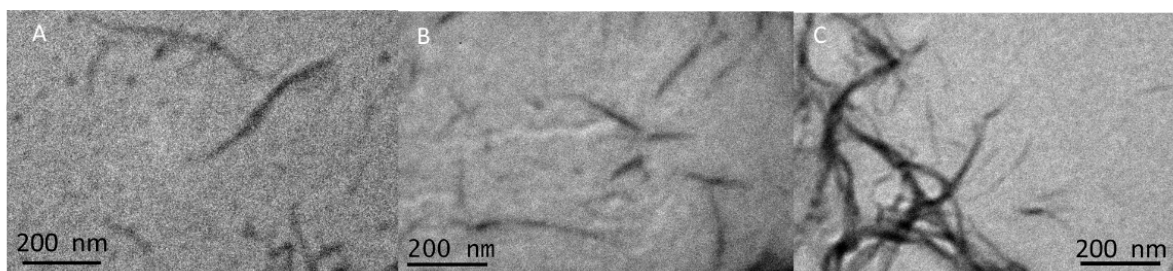


Fig. S1. The TEM microscopy of DNA filaments. (A) DNA filament without polymer; (B) DNA filament in 5 mg/mL PAM in 2 min and (C) in 10 min.

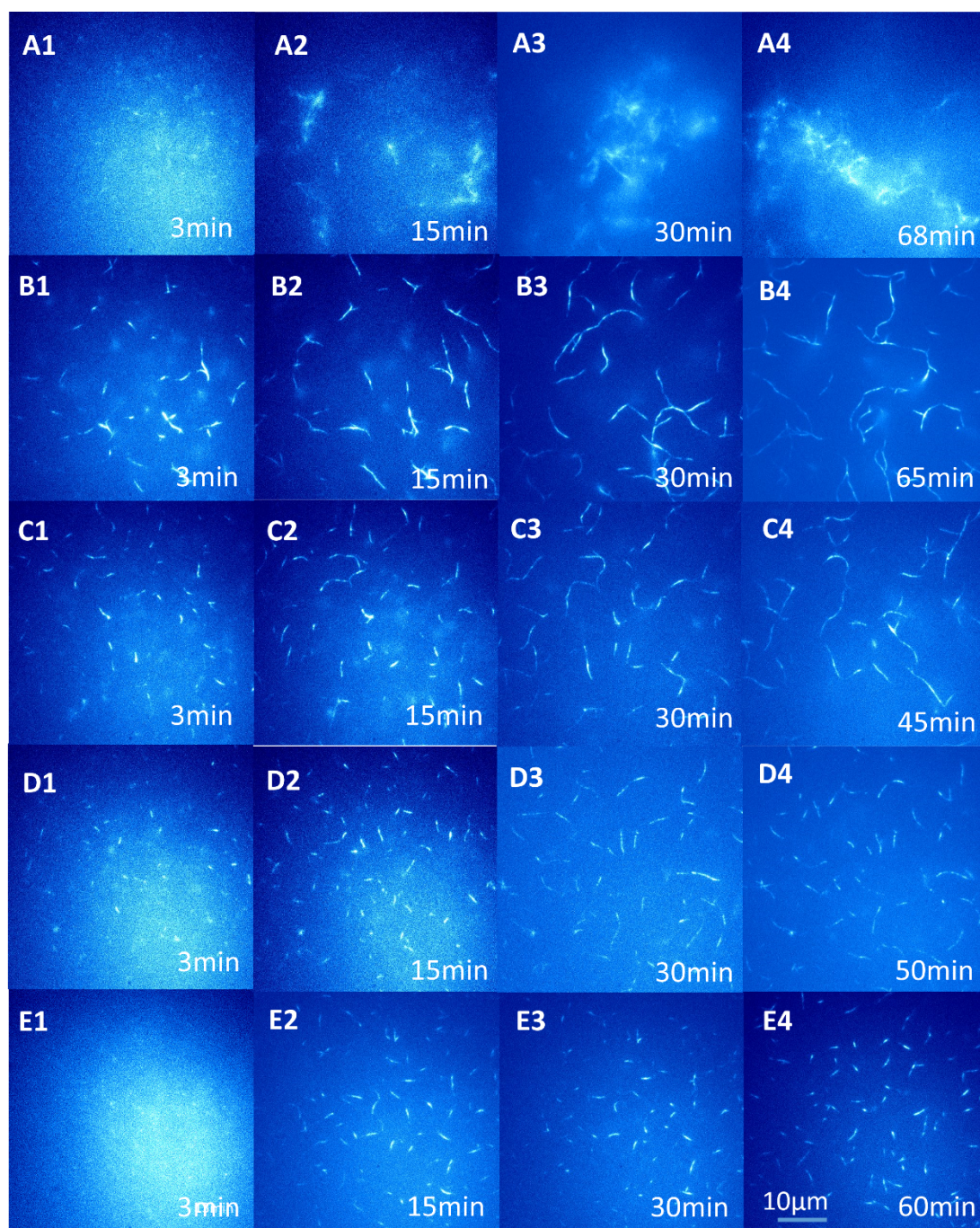


Fig. S2. Video images showing the growth of DNA filament in PAM matrix of varying concentrations (A-E) at selected time points (1-4).