

Electronic Supplementary Information

Topography-controlled alignment of DNA origami nanotubes on nanopatterned surfaces

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Analysis of DNA origami alignment

Fig. S1 depicts AFM phase images of DNA origami nanotubes adsorbed to nanopatterned Si substrates with 30 nm periodicity. The statistical analysis of the alignment of the DNA origami nanotubes has been performed by counting individual DNA origami and measuring their orientation with respect to the ripple structures using Gwyddion open source software. Before AFM imaging, the ripple structures were positioned to be perpendicular to the fast scan direction (Insets in Fig. S1, arrow X). Then, the angle β between the fast scan direction and the connection of the two ends A and B of each DNA origami nanotube was measured as shown in Fig. S1 (insets).

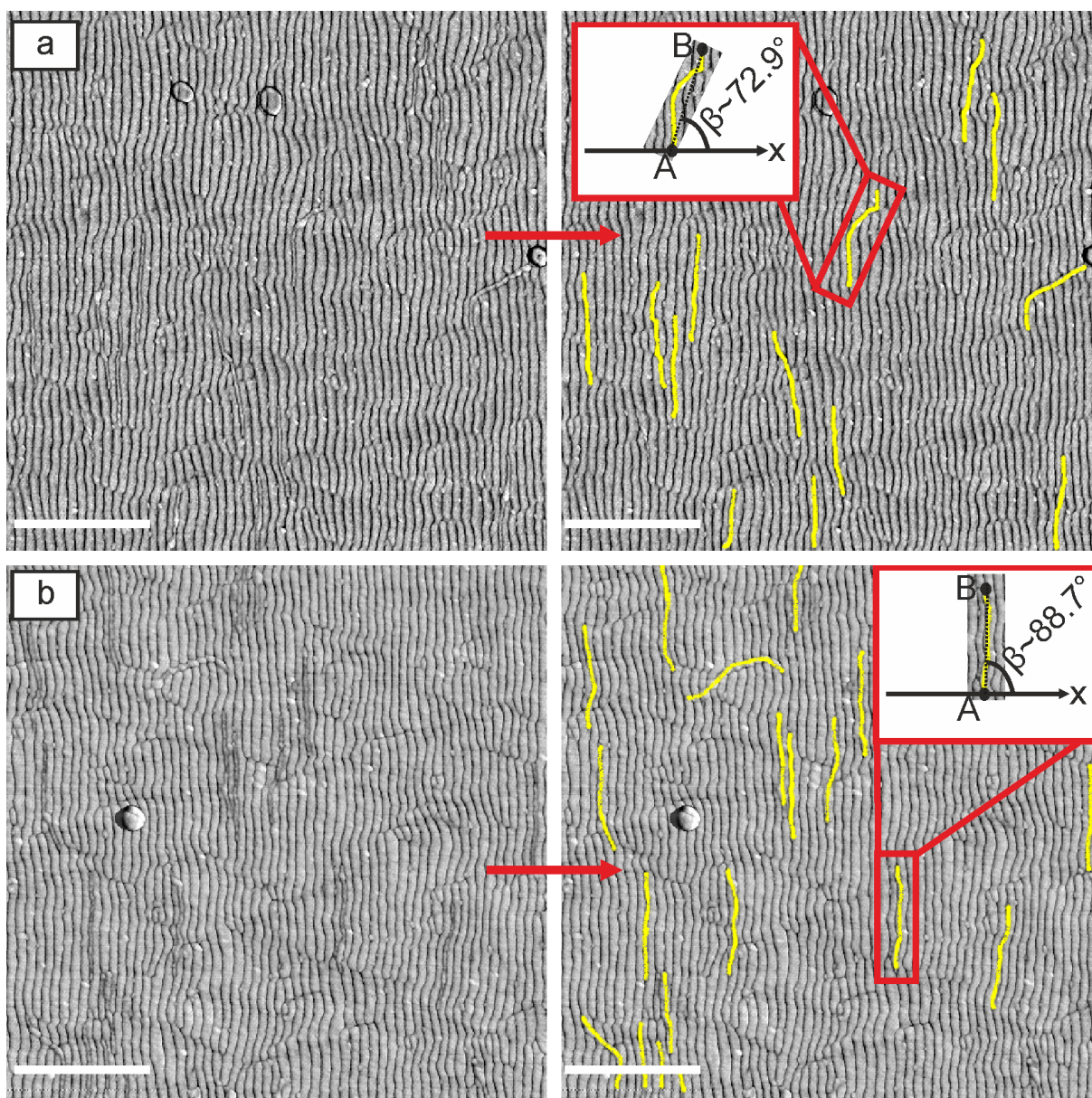


Fig. S1. AFM phase images of DNA origami nanotubes adsorbed to 30 nm Si substrates. All DNA origami nanotubes have been highlighted in the right column. The insets illustrate the angle measurement of the DNA origami nanotubes. The scale bars are 500 nm.

AFM zooms

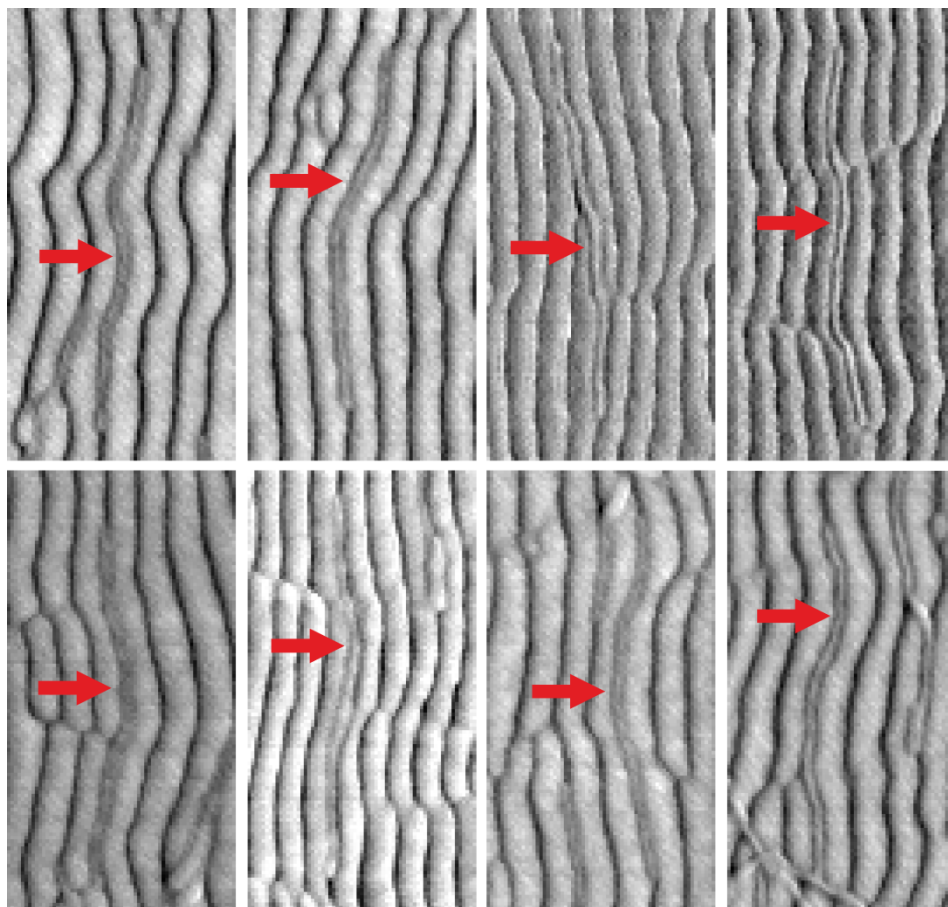


Fig. S2. Zoomed AFM phase images of DNA origami nanotubes adsorbed to 30 nm ripple patterns. The nanotubes follow the patterns perfectly and even reproduce pattern defects.

Adsorption to 20 nm and 50 nm ripple patterns at high Mg^{2+} concentration

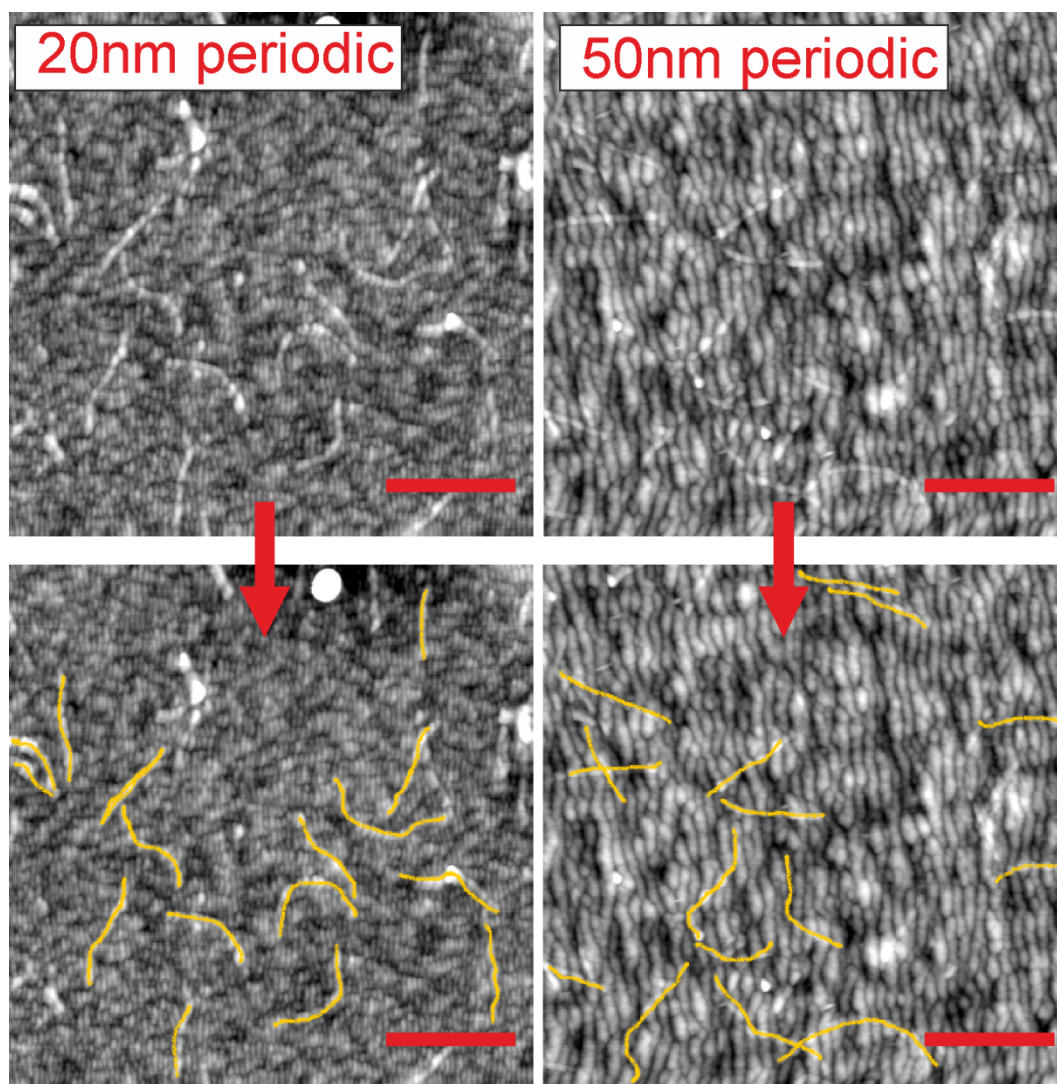


Fig. S3. AFM images of DNA origami nanotubes adsorbed to 20 nm (left) and 50 nm (right) ripple patterns at a Mg^{2+} concentration of 500 mM. In the lower images, the adsorbed DNA origami nanotubes have been highlighted. The scale bars are 500 nm.

TEM image of a rippled Si surface

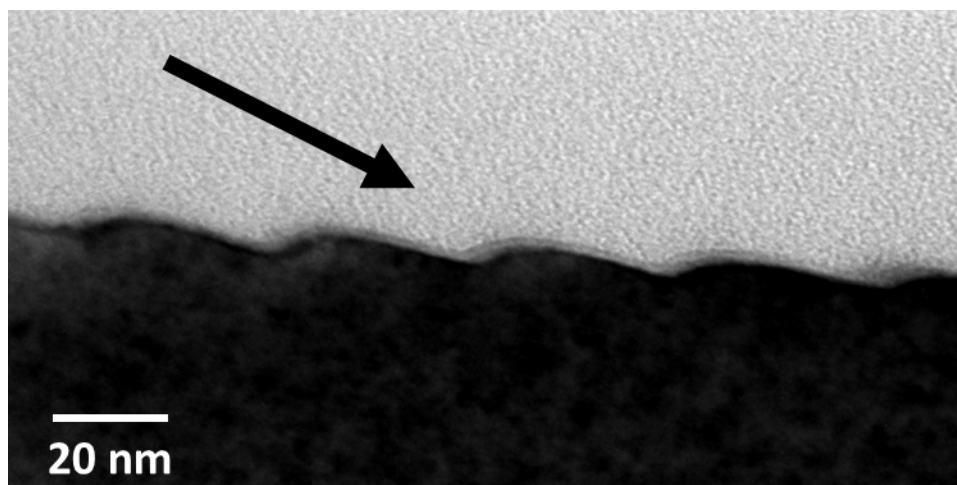


Fig. S4. Cross-sectional transmission electron microscopy (TEM) image of a rippled Si surface with a periodicity of ~ 30 nm. The direction of the ion beam is indicated by the arrow.

Molecular combing

In order to evaluate a possible molecular combing effect, the samples were dipped and withdrawn from the $\text{H}_2\text{O}/\text{EtOH}$ bath in three different orientations as shown in Fig. S4.

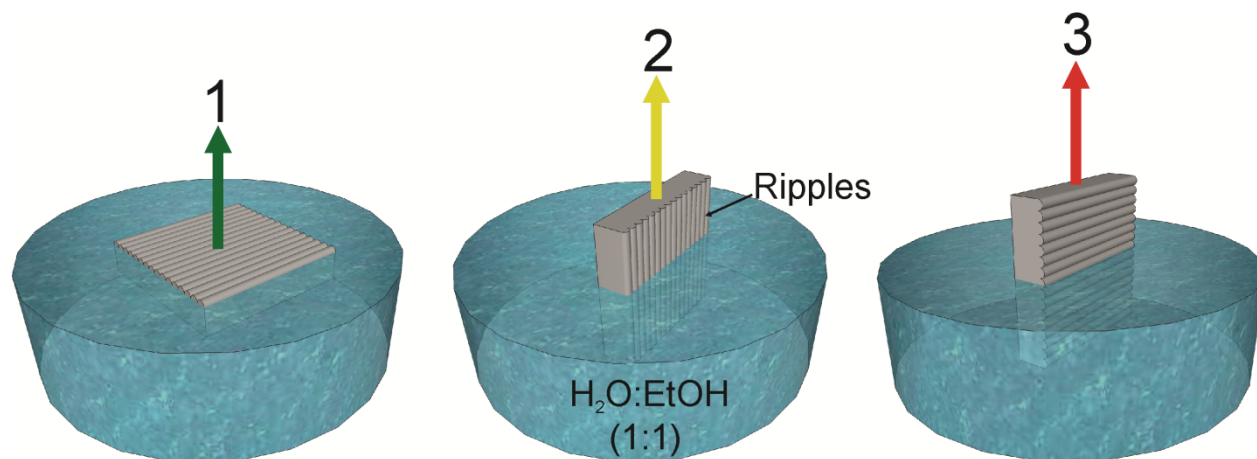


Fig. S5. Withdrawal of the samples from the $\text{H}_2\text{O}/\text{EtOH}$ bath in three different orientations: 1 – perpendicular to the substrate surface; 2 – parallel to the orientation of the ripples; 3 – perpendicular to the orientation of the ripples.

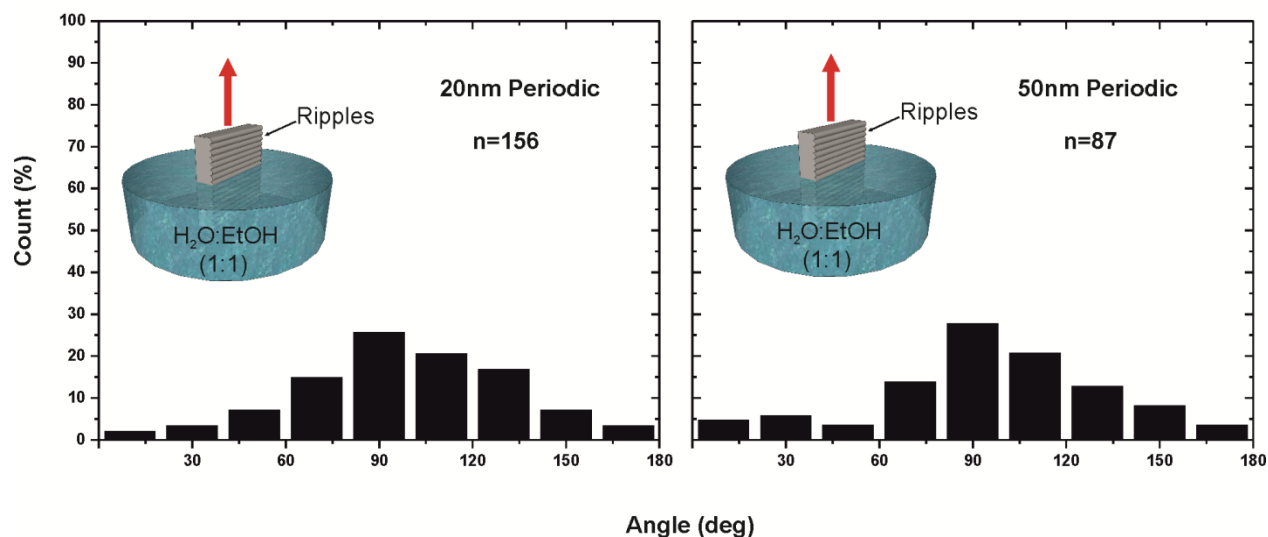


Fig. S6. Angular distributions of DNA origami nanotubes on ripple patterns with 20 nm and 50 nm periodicity after withdrawal perpendicular to the orientation of the ripples. Alignment yields of 25.6 % and 27.5 %, respectively, are obtained.

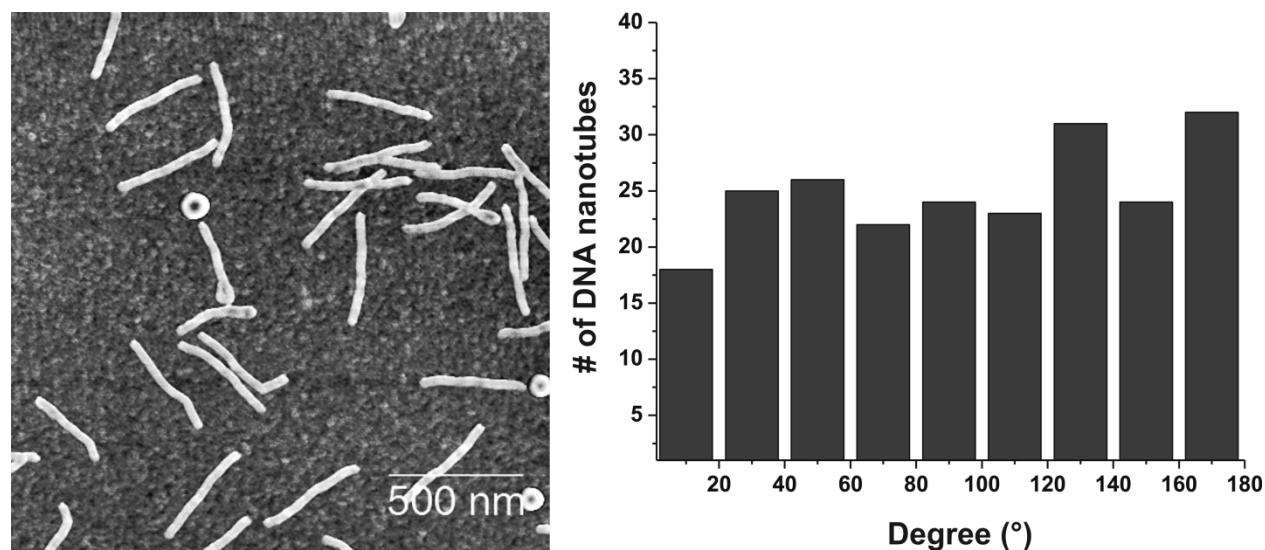


Fig. S7. AFM image and angular distribution of DNA origami nanotubes on flat silicon surfaces after molecular combing.