

# Plateau–Rayleigh Instability Induced Self-Assembly of Nano-Cubes in Stretched DNA Molecules

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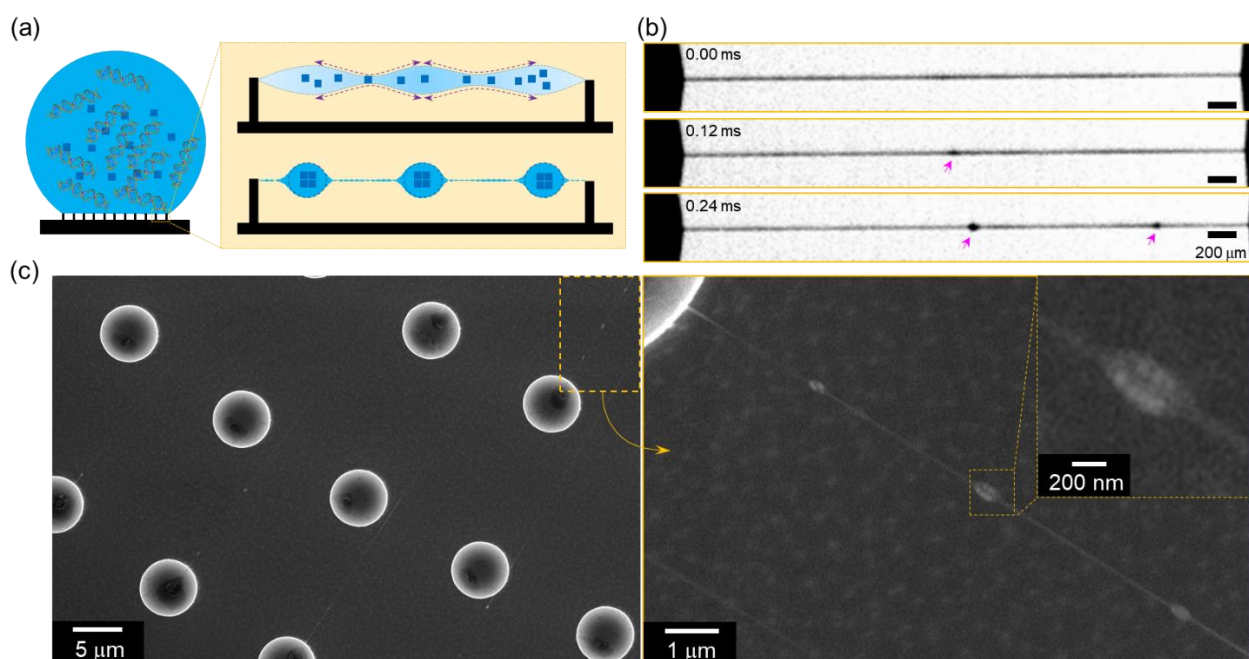
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## Abstract

The Plateau–Rayleigh instability is widely noticed phenomenon in nature, such as the Spider web.[1] It is driven by surface tension and has huge influence in many applications from single-molecule characterizations to industrial fiber manufacturing. [2-4] By taking advantages of Plateau–Rayleigh instability, we introduced a new method to produce self-assembly of silver nano-cube (AgNC) in stretched DNA molecules which is highly potential used for surface-enhance Raman spectroscopy (SERS) detection. 10  $\mu$ L lambda DNA ( $\lambda$ -DNA) solution with 75-nm AgNC was placed on a micro-pillar array based super-hydrophobic substrate and dried at room temperature. With the receding of the contact line,  $\lambda$ -DNA molecules were stretched by the surface tension of water and attached between micro-pillars. Scanning electron microscopy (SEM) images of these dried DNA molecules showed clearly that AgNC assembled along these DNA molecules formed nano-satellites and patterns with tiny (few-nanometer) gaps. To understand this phenomenon, we applied high-speed camera imaging (33,000 frame-per-second) to characterize the pinch-off process of the  $\lambda$ -DNA solution and it gave us a direct evidence that the Plateau–Rayleigh instability happens in the process.

## References

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**Figure 1.** (a) Schematic diagram shows  $\lambda$ -DNA and AgNC mixture solution on a micro-pillars based super-hydrophobic substrate and the Plateau–Rayleigh instability induced AgNC self-assembly in DNA molecules. (b) high-speed camera imaging (33,000 frame-per-second) of  $\lambda$ -DNA solution pinch-off and the process of nano-satellites formation induced by Plateau–Rayleigh instability. (c) SEM images of dried  $\lambda$ -DNA molecules on micro-pillars and AgNC assembled along these  $\lambda$ -DNA molecules formed nano-satellites and patterns with tiny (few-nanometer) gaps.