Ultrastructural characterizations of DNA nanotubes using scanning tunneling and atomic force microscopes

OBJETIVE

Demonstrate potential applications of scanning tunneling microscopy and atomic force microscopy for the characterizations of DNA nanotubes in nanoscale .

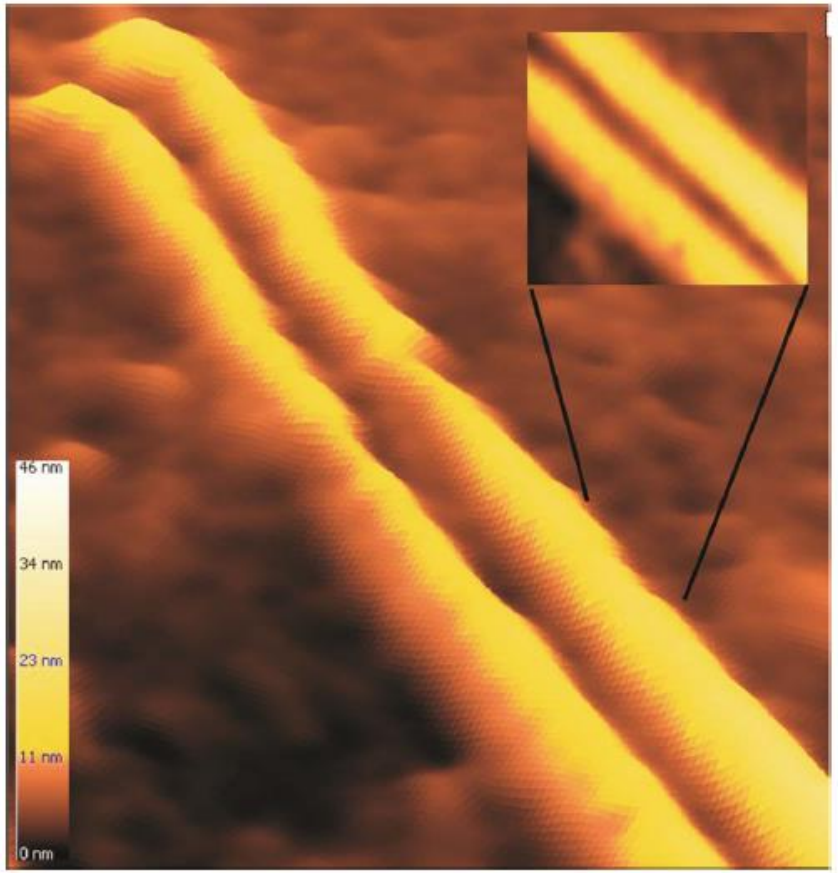
SAMPLE PREPARATION

The gel-extracted DNA nanotubes were diluted 10^3-folds in Tris base, acetic acid, and EDTA–Mg^{2+} buffer (pH 8.0). Then, 5 µL of diluted sample was immobilized on the highly ordered pyrolytic graphite (HOPG) by drying for 3 hours at room temperature.

DATA ACQUISITION

The samples were imaged using topographic mode with 0.1 nA current set point and 0.2 V sample bias through a Pt–Ir tip. Rough data were first processed by using line adjust, plain adjust, and average filters of the NAMA-STM Nanoanalyzer software (Nanotechnology System Corporation, Tehran, Iran). Then, the coloring process was tested on the obtained micrographs for different levels. Scanned using the constant-current mode with a low scan rate, an ultrahigh-vacuum condition and slow frequency.

REPRESENTATIVE FIGURE AND RESULT



Indicates the two-dimensional micrograph of the nanotubes. This micrograph demonstrated highly ordered nanotemplates clearly and an helical surface structure.

CONCLUSION

STM revealed the details of the molecular organization. the DNA-nanotube ultrastructures, are essential for designing and fabricating DNA nanotubes for new applications in biomedicine.

REFERENCE

Rafati, Adele and Gill, Pooria, "Ultrastructural characterizations of DNA nanotubes using scanning tunneling and atomic force microscopes," *Journal of Microscopy and Ultrastructure,* vol. 4, pp. 1 – 5, 2016.