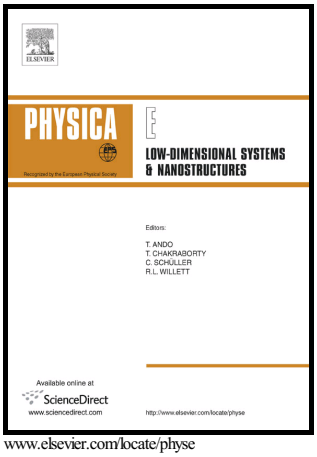
Biophysical and electrochemical properties of Self-assembled noncovalent SWNT/DNA hybrid and electroactive nanostructure

Aboulfazl Mirzapoor, Bijan Ranjbar



www.elsevier.com/locate/physe

PII: S1386-9477(16)31545-4
DOI: http://dx.doi.org/10.1016/j.physe.2017.06.008
Reference: PHYSE12829

To appear in: *Physica E: Low-dimensional Systems and Nanostructures*

Received date: 21 December 2016
Revised date: 28 May 2017
Accepted date: 6 June 2017

Cite this article as: Aboulfazl Mirzapoor and Bijan Ranjbar, Biophysical and electrochemical properties of Self-assembled noncovalent SWNT/DNA hybrid and electroactive nanostructure, *Physica E: Low-dimensional Systems and Nanostructures,* http://dx.doi.org/10.1016/j.physe.2017.06.008

Biophysical and electrochemical properties of Self-assembled noncovalent SWNT/DNA hybrid and electroactive nanostructure

Aboulfazl Mirzapoor[1], Bijan Ranjbar[1,2,*]

[1] Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, P.O. Box 14115-175, Tehran, Iran

[2] Department of Biophysics, Faculty of Biological Sciences, Tarbiat Modares University, P.O. Box 14115-175, Tehran, Iran

[*]**Correspondence to:** Departments of Biophysics and Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, P.O. Box 14115-175, Tehran, Iran. Tel: +98 21 82883418. ranjbarb@modares.ac.ir

Abstract:

DNA self-assembled hybrid nanostructures are widely used in recent research in nanobiotechnology. Combination of DNA with carbon based nanoparticles such as single-walled carbon nanotube (SWNT), multi-walled carbon nanotube (MWNT) and carbon quantum dot were applied in important biological applications. Many examples of biosensors, nanowires and nanoelectronic devices, nanomachine and drug delivery systems are fabricated by these hybrid nanostructures. In this study, a new hybrid nanostructure has been fabricated by noncovalent interactions between single or double stranded DNA and SWNT nanoparticles and biophysical properties of these structures were studied comparatively. Biophysical properties of hybrid nanostructures studied by circular dichroism, UV-Vis and fluorescence spectroscopy techniques. Also, electrochemical properties studied by cyclic voltammetry, linear sweep voltammetry, square wave voltammetry, choronoamperometry and impedance spectroscopy (EIS). Results revealed that the biophysical and electrochemical properties of SWNT/DNA hybrid nanostructures were different compare to ss-DNA, ds-DNA and SWNT singly. Circular dichroism results showed that ss-DNA wrapped around the nanotubes through π-π stacking interactions. Also, some of nucleic acids enters on sidewall and central hole on SWNT. The