



Supporting Information

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**Electronic Supporting Information for:**

# **DNA Hydrogel Fiber with Self-Entanglement Prepared Using an Ionic Liquid**

Chang Kee Lee, Su Ryon Shin, Sun Hee Lee, Ju-Hong Jeon, Insuk So, Sun I. Kim, Ji Young Mun, Sung-Sik Han, Geoffrey M. Spinks, Gordon G. Wallace, Seon Jeong Kim\*

## **[ DNA Hydrogel Fiber ]**



The DNA hydrogel fiber was prepared by wet spinning using room temperature ionic liquid (RTIL; 1-butyl-3-methylimidazolium tetrafluoroborate; [C<sub>4</sub>mim]BF<sub>4</sub>) as a condensing agent and coagulation solvent.

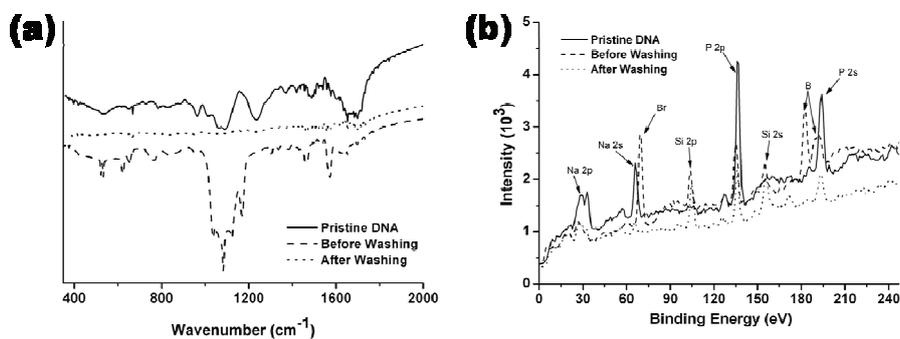
## **[ Characterization of DNA hydrogel fibers]**

To measure the swelling ratio of the DNA hydrogel fiber, premeasured dry samples were immersed in deionized water and various salt solutions. The length of the swollen samples was measured after any excess surface solvent had been removed using filter papers. This procedure was repeated 10 times until there was no further length increase. The swelling ratio was calculated using the following equation:

$$Swelling\_Ratio(\%) = \left( \frac{L_s - L_d}{L_d} \right) \times 100$$

where L<sub>s</sub> and L<sub>d</sub> denote the length of samples in the swollen and dry states, respectively.

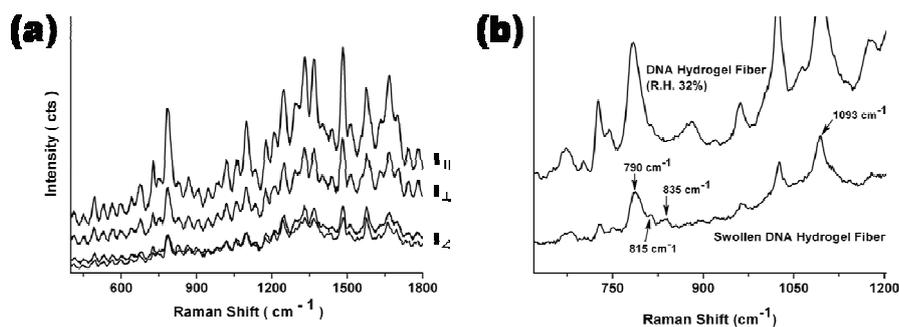
## [ Fourier Transform Infrared spectrum and X-ray Photoelectron Spectroscopy ]



S1. Evaluation of any ionic liquid remaining in the DNA hydrogel

FT-IR (Fourier Transform Infrared spectrum) and XPS (X-ray Photoelectron Spectroscopy) analyses were used to test for any ionic liquid residue remaining in the DNA hydrogel fiber. In the FT-IR analysis (a), peaks between 1000 cm<sup>-1</sup> and 1200 cm<sup>-1</sup> were attributed to the ionic liquid. The ionic liquid was thus removed efficiently by ethyl alcohol washing. XPS also showed that the ionic liquid was absent. These studies confirmed that the ionic liquid had been removed from the DNA hydrogel fiber.

## [ Raman Spectroscopy ]



### S2. Raman spectroscopy

Figure S2 (a) shows the polarized Raman spectroscopy of oriented DNA fiber which was used for preparation of the DNA hydrogel fiber. The absorbances are measured for the Raman radiation parallel, oblique and perpendicular to the helical axes and fiber axes,  $I_{||}$ ,  $I_{\perp}$  and  $I_{\perp}$ , respectively. The intensity ratio ( $I_{||}/I_{\perp}$ ) of oriented DNA was about 0.68, which indicates that the DNA strands can be considered to be ordered according to its fiber axis.

In Figure S2 (b), 790, 835, 1093 cm<sup>-1</sup> is a marker for B-DNA that was observed when the DNA fiber swollen. The band of 815 cm<sup>-1</sup> is also a marker for double helix DNA. Thus, DNA hydrogel fiber maintained its original character.