Crystalline Structure of Electrospun Peptide

Wiwat Nuansing, Alexander Bittner
CIC nanoGUNE, Tolosa Hiribidea, 76, 20018 Donostia – Sansebastian, Spain
w.nuansing@nanogune.eu

We demonstrate the ability to fabricate a small peptide modified with a large aromatic group into fiber form with diameters ranging in micrometers by using the electrospinning technique [1, 2].

Fmoc-Phenylalanyl-Glycine (Fmoc is based on the 6-5-6 ring system of fluorene) was dissolved in a highly polar solvent (hexafluoro-2-propanol) and a droplet was polarized to up to 15 kV in a electrospinning system. The resulting peptide fibers were studied using confocal Raman spectroscopy and compared to known IR spectra of Fmoc-Phe.

An optical microscopic image of electrospun Fmoc-Phe-Gly and a micro-Raman confocal image are shown in Fig 1. The Raman spectra (Fig 2.) feature mainly vibrations of the fluorenyl group. Scanning electron microscopy (SEM) (Fig 3), micrometer-sized fibers are composed of rod-like crystallites of ~350 nm diameters.

We suggest the formation of peptide fibers because the aromatic residues in the peptide (fluorenyl and phenyl) cause π-stacking of the molecules [3]. Hence molecules assemble into fibers when electrospinning assists the molecular alignment.

References:

[1] D. Li, Y. Xia, Adv. Mater., **16** (2004) 1151-1170.
[2] T.J Sill, H.A Recum, Biomater., **29** (2008) 1989-2006.
[3] G. Singh, A.M Bittner, S. Loscher, N. Malinowski, K. Kern, Adv. Mater., **20** (2008) 2332.

Figures:

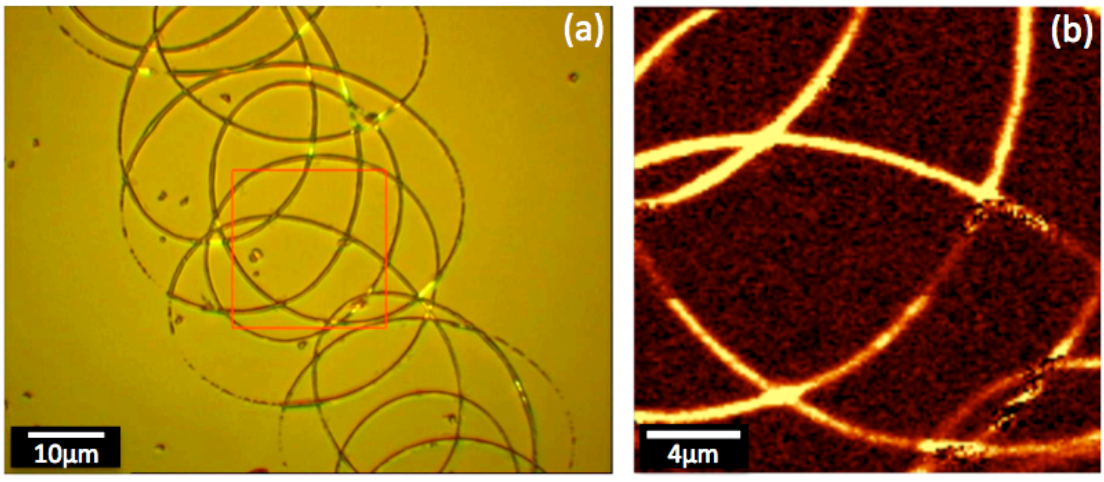

Fig 1. (a) Optical microscopic image of electrospun Fmoc-Phe-Gly on glass substrates (b) Micro-Raman confocal image at the red by used the filter at 1594.6 – 1631.4 cm^{-1}.

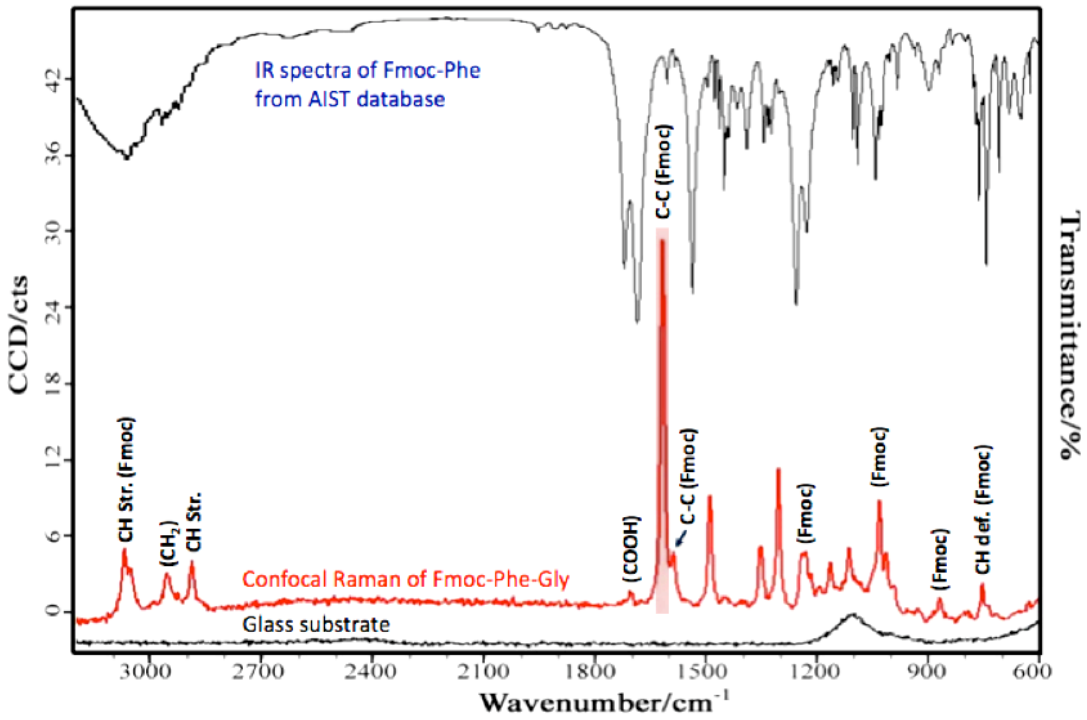

Fig 2. Confocal Raman spectra of the electrospun Fmoc-Phe-Gly fibers on glass substrates compared to IR spectra of Fmoc-Phe from AIST database.

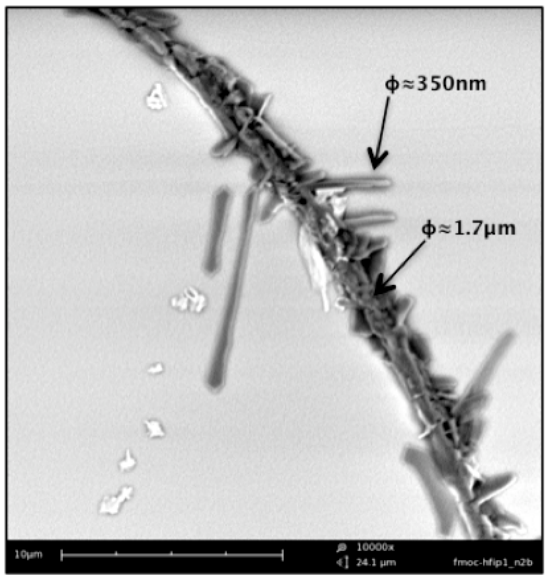

Fig 3. SEM micrograph of the electrospun Fmoc-Phe-Gly.