Supplementary data

Bending of Peptide Nanotubes by Focused Electron and Ion Beams

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Synthesis of cyclo-L-GSGGSG (1) and L-Phe-Phe (2) - Synthesis of cycloGSGGSG (**1**) was done via routine solution phase synthesis and is not published yet, while Phe-Phe (**2**) was synthesized by previously reported procedure.[1]

Sample preparation for Focused Ion Beam-Scanning Electron Microscopy (FIB-SEM): Cyclo-GSGGSG (**1**) and diphenylalanine (**2**) were dissolved in 50% aqueous methanol respectively and incubated at 37 °C for 30 days. 20 µl solution of both the peptide sample was dispersed on separate Cu stubs. Samples were dried under lamp for 15 mins and subsequently gold coating was done for 1 minute in EMITECH, UK, K550X sputter coater, operating at 25 mA. This procedure coats peptide surface with 7 nm layer of gold. The gold coated dried sample was mounted on stage and image was taken with the help of focused-ion-beam/scanning electron microscope dual beam system (NOVA 600 NANOLAB, D97 FEI) using a Gallium ion source (15-30 kV) operating at WD 4.9mm.Two ion sources are lying at an angle of 52º with respect to each other. 3D image of sample can be obtained by tilting the stage by 52º. (See Figure S1)

Electron beam induced bending of nanotube - Image cropped from typical video (available at) at a regular interval of 1 min for tube having diameter 180nm has been shown in Figure 1 of main text. The video pertaining to these images was taken during scanning by 30kev electron beam at a beam current of 0.15nA, dwell time of 1µs and beam spot size 7.1nm. The total area of 3 × 3µm2 was scanned for 3mins 14s with a line scan time of 6.4 µs and frame scan time of .400s. Images shown in (Figure 3 of main text) have been cropped from video showing bending of FF fiber having diameter 140 nm by electron beam irradiation. The video pertaining to these images was taken during scanning by 30 kev electron beam.at a beam current of 2.4 nA,

dwell time of 0.3µs and beam spot size 6.3 nm.

Ion beam induced bending of nanotube - Images cropped from the video (available at) at a regular interval of 4s for nanotube of **1** having cross section 320 nm are shown in Figure S2. Video pertaining to these images was taken during 30 keV Ga ion beam scanning at a current of 0.5 nA and dwell time of 50 ns and beam spot size of 33 nm.

Elecron beam bending inducing change in shape of nanofiber and subsequent regeneration by ion beam- Images were cropped from the video (available at) which revealed bending of peptide fiber of 1 by electron beam in such a way that final shape of peptide fiber was drastically changed (Figure 4 of the main text). When this fiber was again subjected to ion beam irradiation the original shape of peptide was almost retained. The video pertaining to these images was taken during scanning by 30 keV electron beam, at a beam current of 0.139 nA, dwell time of 1µs and beam spot size 9.2 nm The total area of 5 × 5 µm2 was scanned for 1 min 45 s with a line scan time of 0.001 s and frame scan time of 0.98 s.

Figures:

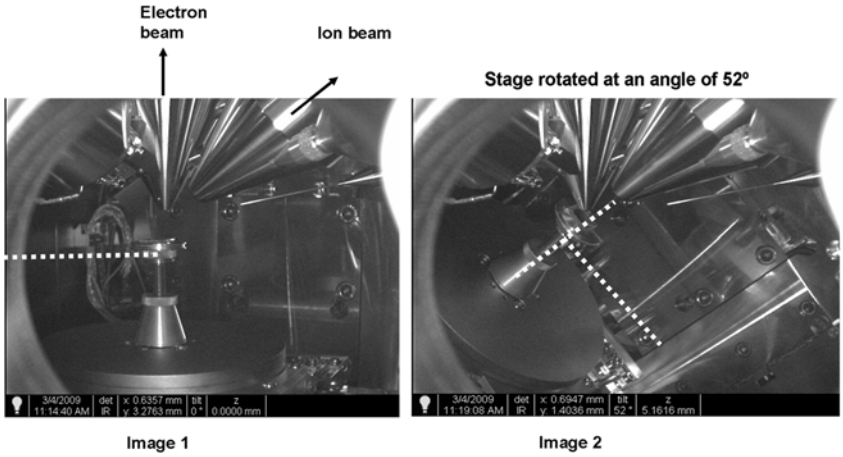

Figure S1**:** Image 1 shows two ion sources in FIB which are inclined at an angle of 52º. In this condition electron beam source is lying perpendicular to substrate. Image 2 shows position of two ion sources in FIB when stage is rotated by 52º. In this case electron source is lying 52º with respect to normal of substrate.

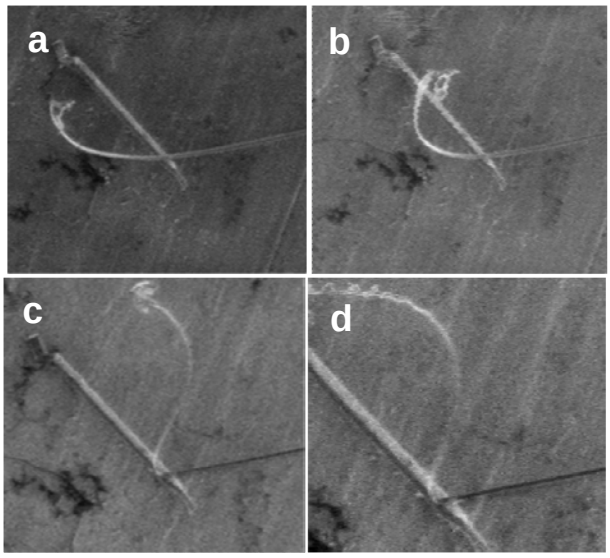

Figure S2 Ion beam images cropped from a video showing the bending effect of Ga ion beam scanning on a nanotube.of **1** at regular intervals of 4 s.

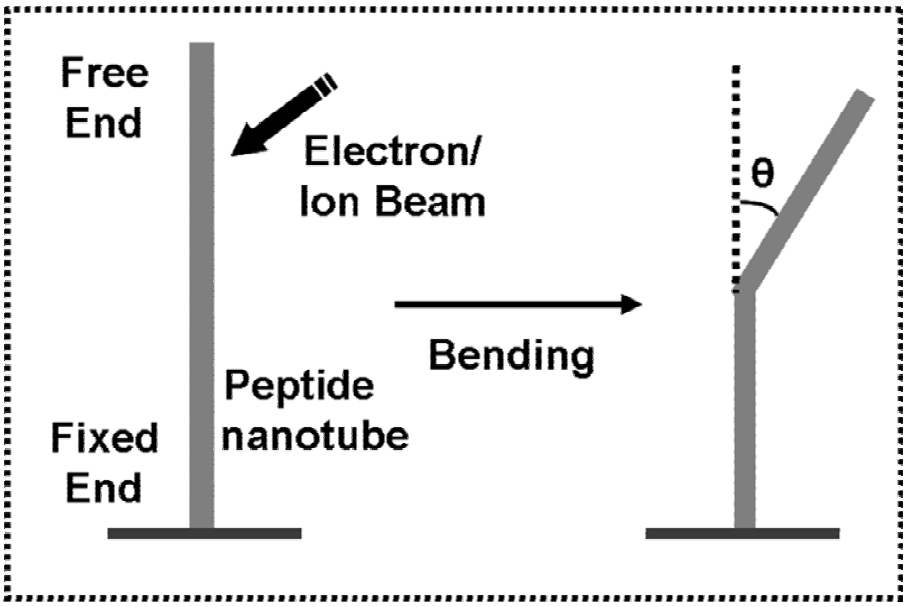

Figure S3 Diagrammatic representation of bending of peptide nanotube by e-beam/ion beam.

References:

1. S.Ghosh and S. Verma, *Chem. Eur. J.* **2007**, *14*, 1415-1419.