Electronic Supplementary Information

Conducting Polymer Nonofibers of Controlled Diameter Synthesized in Hexagonal Mesophases

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Table S1Composition of mesophases used for polymerization.

Salt (NaCl) (M)	**SDS (g)**	**Salted water (mL)**	**Swelling ratios (ϕ, *v/v*)**	**Oil (Cyclohexane) (mL)**	**Pentanol (mL)**
0.3	0.8	2	2.21	4.42	~0.417
0.1	1	2.5	0.98	2.45	~0.479
0	1.7	4.25	0.72	3.06	~0.737

Fig. S1

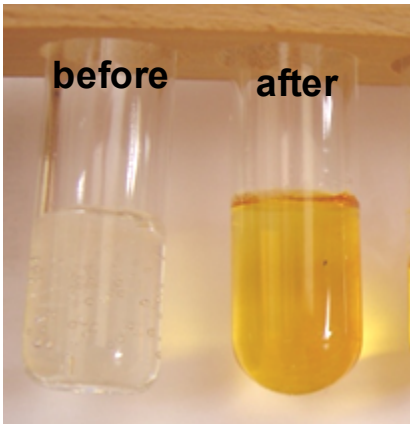

Fig.S1 Photographs of hexagonal mesophases doped with monomer (DPB) and photoiniator (BME) with $\phi = 2.21$and $C_s = 0.3$ M NaCl, before and after UV irradiation exposure. The color change indicates the polymerization of DPB in presence of BME by UV irradiation.

Fig. S2

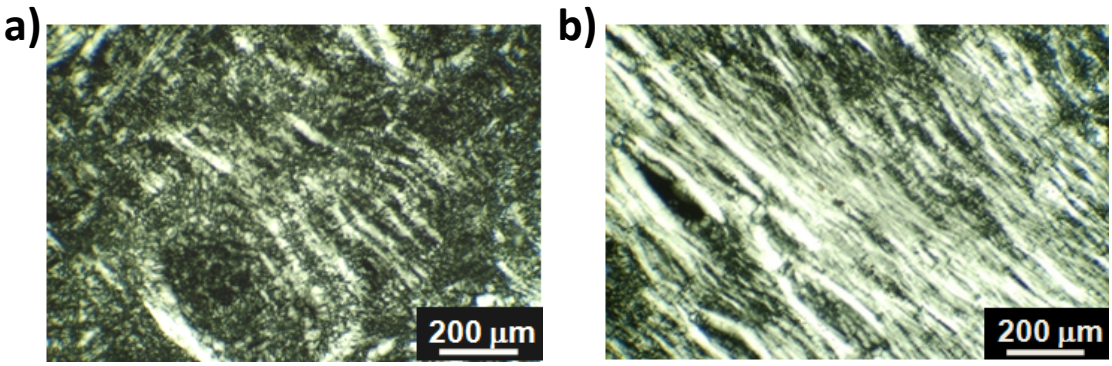

Fig.S2 Polarized light micrographs of hexagonal mesophases (a) before and (b) after gamma irradiation induced polymerization in mesophases with $\phi = 2.21$ and $C_s = 0.3$ M NaCl. After polymerization, PDPB polymer shows a large degree of preservation of the birefringent pattern indicative of the stability of hexagonal LC phase.

Fig. S3

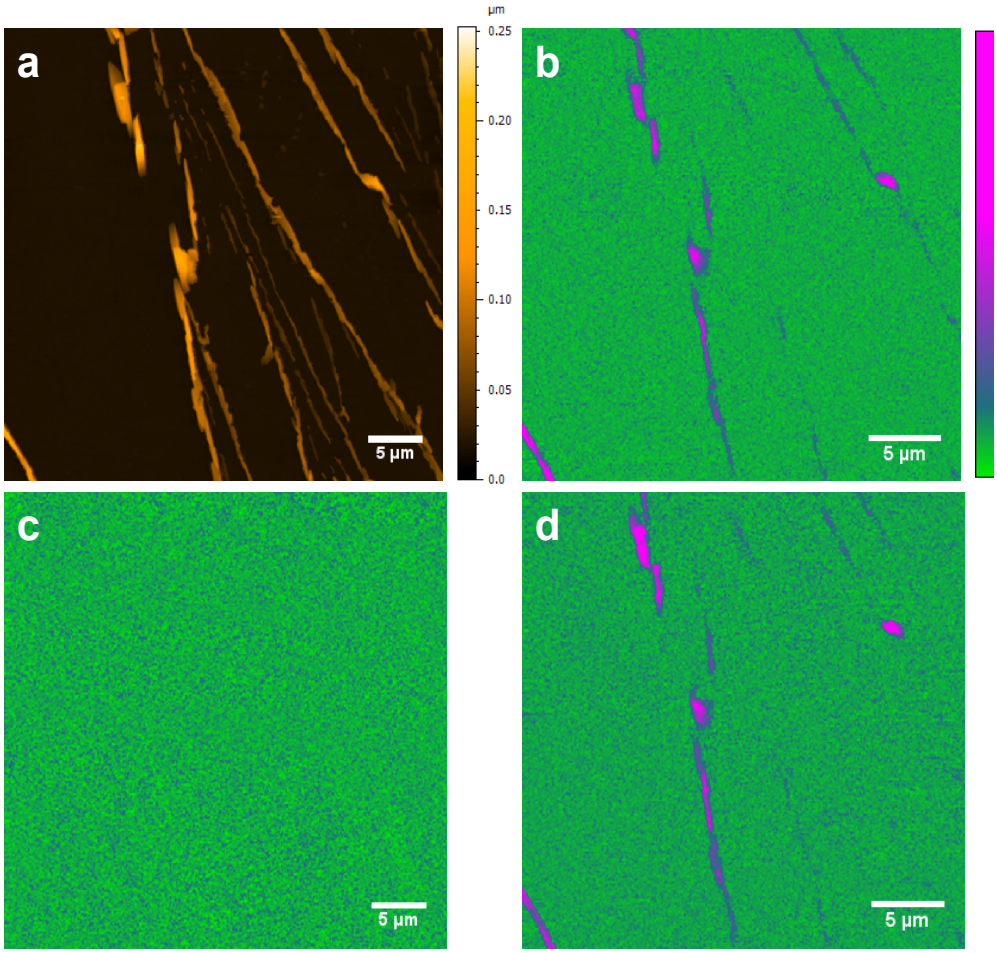

Fig.S3 (a) Topographic image of PDPB nanostructures synthesized by gamma irradiation obtained by conventional AFM. AFM-IR mappings of PDPB polymer nanostructures synthesized in a swollen hexagonal phase with $\phi = 2.21$, $C_s = 0.3$ mol.L^{-1} measured at different wavenumbers, **(b)** 1490 cm^{-1}, **(c)** 2146 cm^{-1}and **(d)** 3054 cm^{-1}.

Fig. S4

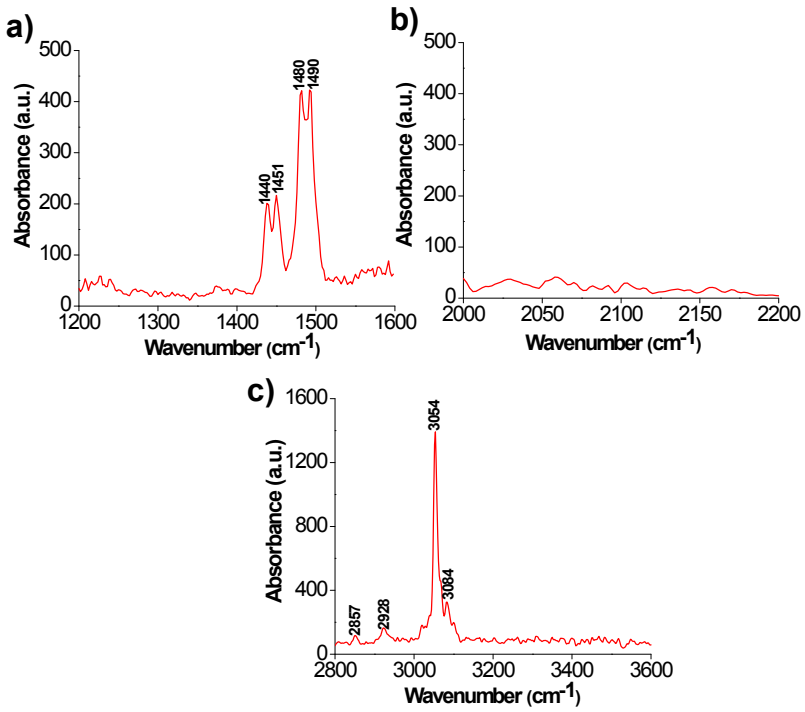

Fig.S4 AFM-IR spectra recorded at three different region of spectrum of PDPB synthesized by gamma irradiation in mesophases with $\phi = 2.21$ and $C_s = 0.3$ M NaCl.

Fig. S5

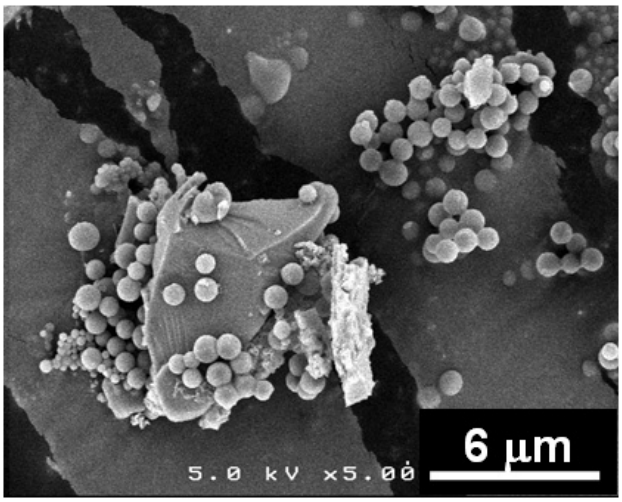

Fig. S5 SEM image of PDPB prepared by UV irradiation in bulk cyclohexane.

Fig. S6

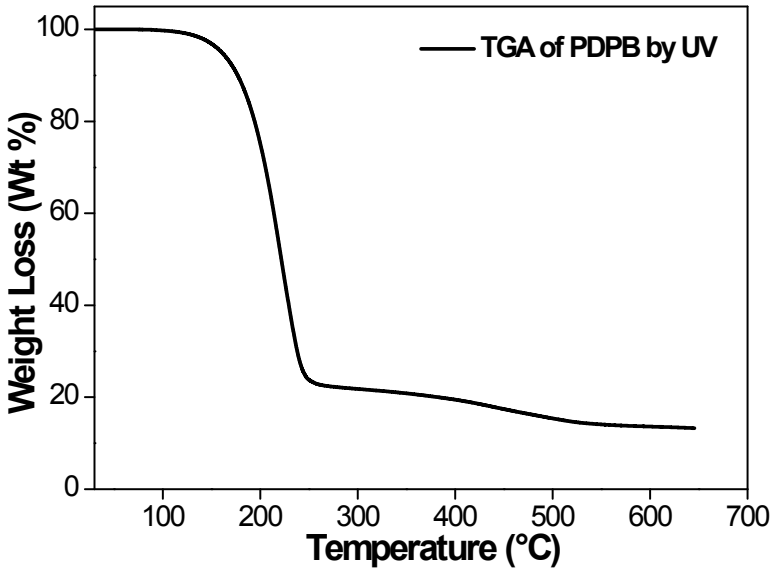

Fig.S6 TGA profile of solid PDPB nanostructures after extraction. A mesophase with swelling ratio ϕ=2.21and C_s= 0.3 M NaCl was used for polymerization by UV-irradiation.

Fig. S7

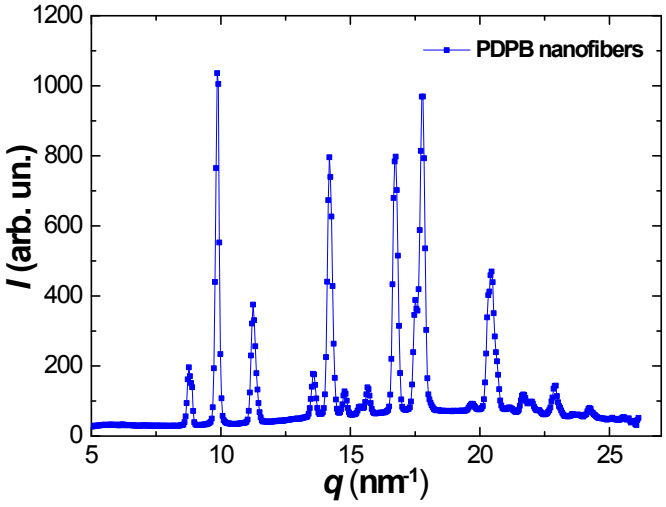

Fig. S7 X-ray diffraction pattern of solid PDPB nanofibers.

Table S2 Comparative values of conductivity of poly(diphenylbutadyine).

No.	Sample	Conductivity (S cm^{-1})	References
1	UV light induced PDPB nanofibers	3.5×10^{-2}	This work
2	Radiolytic synthesis of PDPB nanofibers	1.3×10^{-1}	This work
3	Bulk polyacetylene	10^{-11}	Day *et al., Macromolecules,* 1980, **13**, 1478 –1483.
4	Nanocrystals of Poly(diacetylene)	1.3×10^{-2}	Baba *et al., Jpn. J. Appl. Phys.* 2008, **47**, 376–380.
5	Polydiacetylene thin film (2-20 μm)	$(3\text{-}5)\times10^{-6}$	Takami *et al., J. Phys. Chem. B* 2004, **108**, 16353–16356
6	Polydiacetylene film	10^{-4} ~ 10^{-7}	Nakanishi *et al.*, *Mol. Cryst. Liq. Cryst.,* 1984, **105**, 77–88.
7	Polydiacetylene bilayers	10^{-7}	Day *et al., J. Appl. Polym. Sci.* 1981, **26**, 1605–1612.