Supplementary Information

Synergetic improvement of mechanical properties and surface activities in γ-irradiated carbon fibers revealed by radial positioning spectroscopy and mechanical model

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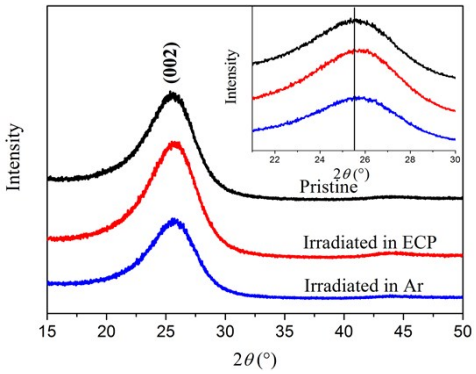

Fig. S1. X-ray diffraction profiles of pristine and irradiated CFs (The inset show the magnified 002 peak in the range of 21-30°).

Table S1 Structural parameters of CFs detected by X-ray diffraction.

Sample	2θ (°)	d_{002} (nm)
As-received	25.34	0.3474
Irradiated in Ar	25.52	0.3450
Irradiated in ECP	25.51	0.3453

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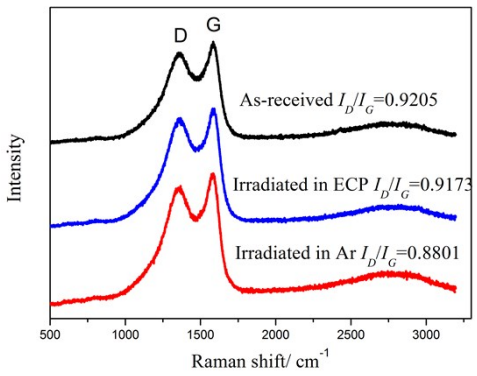

Fig. S2. Raman spectra for surface scan of pristine and irradiated CFs.

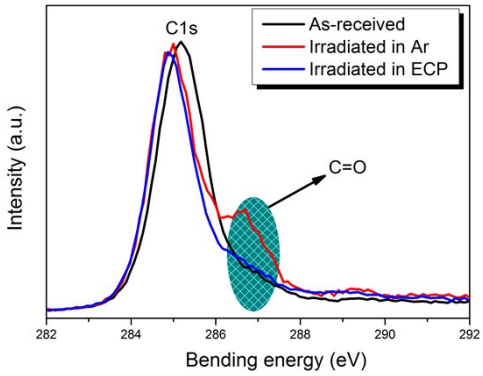

Fig. S3. C1s peak spectra of pristine and irradiated CFs determined by XPS.

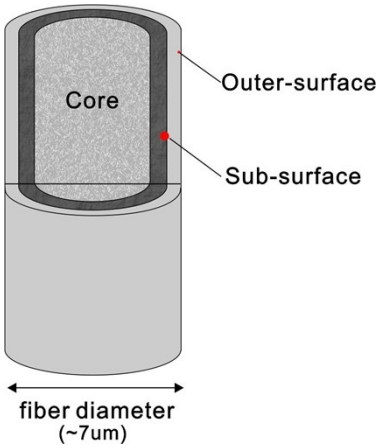

Fig. S4. Schematic illustration of 3-layer structures of CFs consisting of core, sub-surface and outer-surface parts.

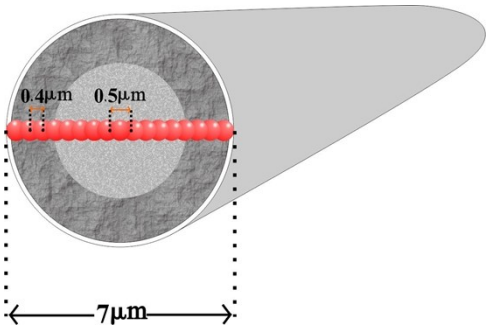

Fig. S5. Schematic illustration of Raman spectra from fiber cross-section.

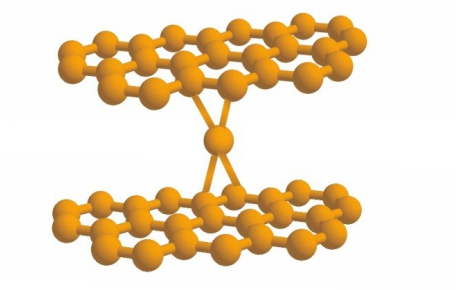

Fig. S6. Schematic illustration of cross-linking between graphene layers [1, 2].

References

[1] Xiao H, Lu Y, Wang M, Qin X, Zhao W, Luan J. Effect of gamma-irradiation on the mechanical properties of polyacrylonitrile-based carbon fiber. Carbon 2013;52:427-39.

[2] Telling RH, Ewels CP, Ahlam A, Heggie MI. Wigner defects bridge the graphite gap. Nat. Mater. 2003;2(5):333-7.