Supporting Information

Enhanced out of plane electrical conductivity in polymer composites induced by CO$_2$ laser irradiation of carbon fibers

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S1. SEM micrographs of PCF and TCF fibers. TCF denotes Toray CFs (T700SC), while PCF denotes the Pyrofil fibers (TR50S). bTCF and bPCF represent control bare non-exposed CFs.

Figure S1. PCF sample irradiated at 2.5 W (25 J/cm²).

Figure S2. PCF sample irradiated at 3.75 W (37 J/cm²).
Figure S3. PCF sample irradiated at 4 W (39 J/cm$^2$).

Figure S4. PCF sample irradiated at 4.25 W (42 J/cm$^2$).
**Figure S5.** PCF sample irradiated at 4.5 W (44 J/cm²).

**Figure S6.** PCF sample irradiated at 4.75 W (47 J/cm²).
**Figure S7.** PCF sample irradiated at 5 W (49 J/cm$^2$).

**Figure S8.** Area of the irradiation for TCF representative samples. (a) TCF$_{4.75}$ W (47 J/cm$^2$), (b) TCF$_{7.5}$ W (74 J/cm$^2$), (c) TCF$_{10}$ W (99 J/cm$^2$).
**Figure S9.** bTCF sample.

**Figure S10.** TCF sample irradiated at 3.75 W (37 J/cm²).
Figure S11. TCF sample irradiated at 4.25 W (42 J/cm²).

Figure S12. TCF sample irradiated at 4.75 W (47 J/cm²).
**Figure S13.** TCF sample irradiated at 7.5 W (74 J/cm\(^2\)).

**Figure S14.** TCF sample irradiated at 10 W (99 J/cm\(^2\)).
Figure S15. bPCF sample.

Figure S16. PCF sample irradiated at 4.25 W (42 J/cm²).
S2. Raman characterization of the PCF UD cloths

Figure S17. Raman spectra of PCF sample irradiated at various powers.