Electronic Supplementary Information

Effective enhancement of the mechanical properties of macroscopic single-walled carbon nanotube fibers by pressure treatment

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1. Calculation of pressure value on ribbon-like fiber

The oil pressure in the laboratory press we used can be obtained through gauge kit, which is represented as p. The cross sectional area of oil cylinder is marked as S. Then the weight M that put on the sample can be obtained by following equation:

$$M = p \times S \quad (1)$$

Specifically, the diamter of oil cylinder in laboratory press we used is 87.8 mm.

Then, after measuring the length and width of ribbon-like fiber, we can obtain contact area (S_0) during the pressure treatment. The pressure value (p_0) that was applied on fibers can be calculated as following:

$$p_0 = M / S_0 \quad (2)$$

2. Tensile testing results of cylindrical fibers and ribbon-like fibers

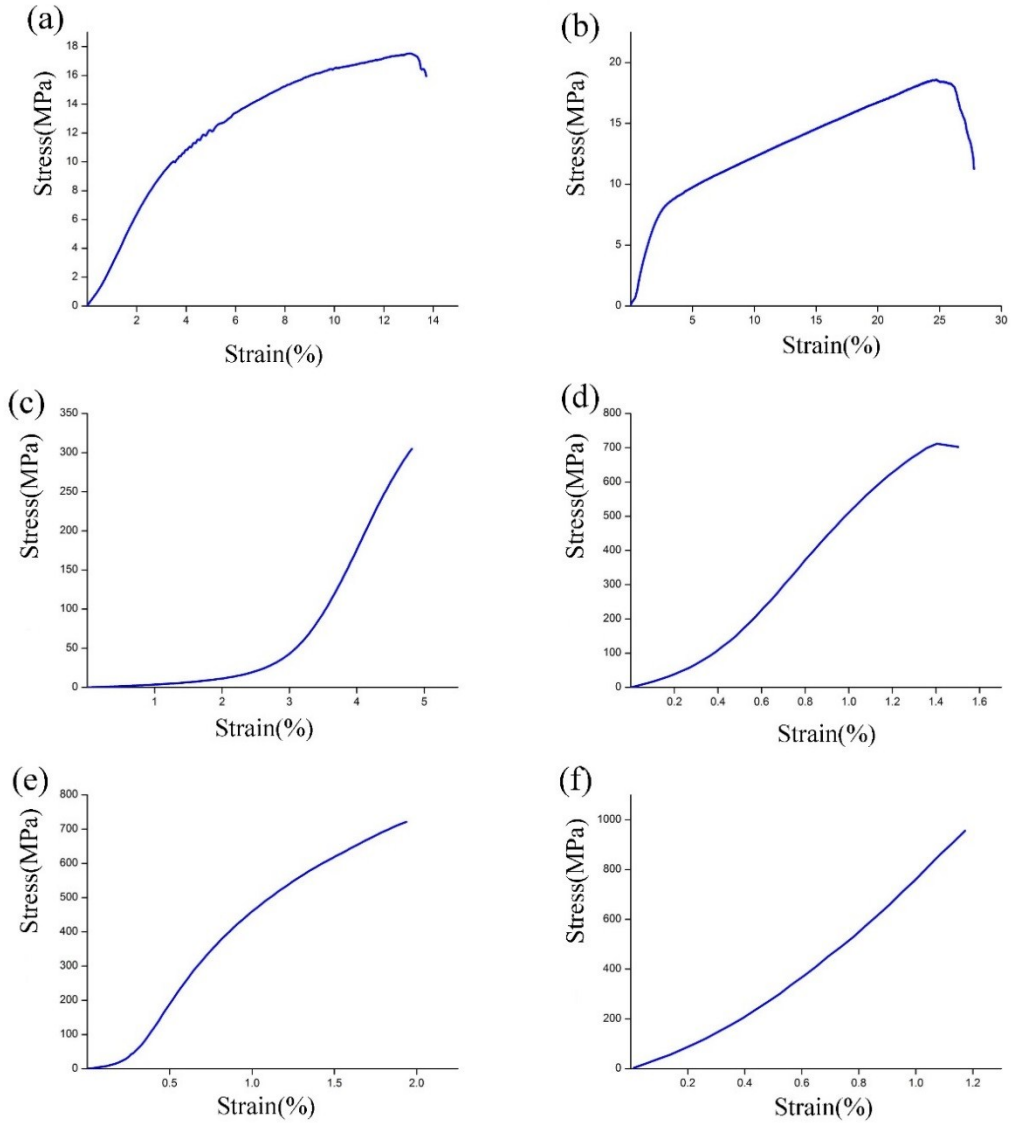

Fig. S1. Stress versus strain curves of cylindrical fibers and ribbon-like fibers, which respond to (a) Cylindrical fiber 1, (b) Cylindrical fiber 2, (c) Ribbon-like fiber 1, (d) Ribbon-like fiber 2, (e) Ribbon-like fiber 3 and (f) Ribbon-like fiber 4 in table Ⅰ, respectively.

3. SEM morphology of fracture surface of ribbon-like fibers after mechanical testing.

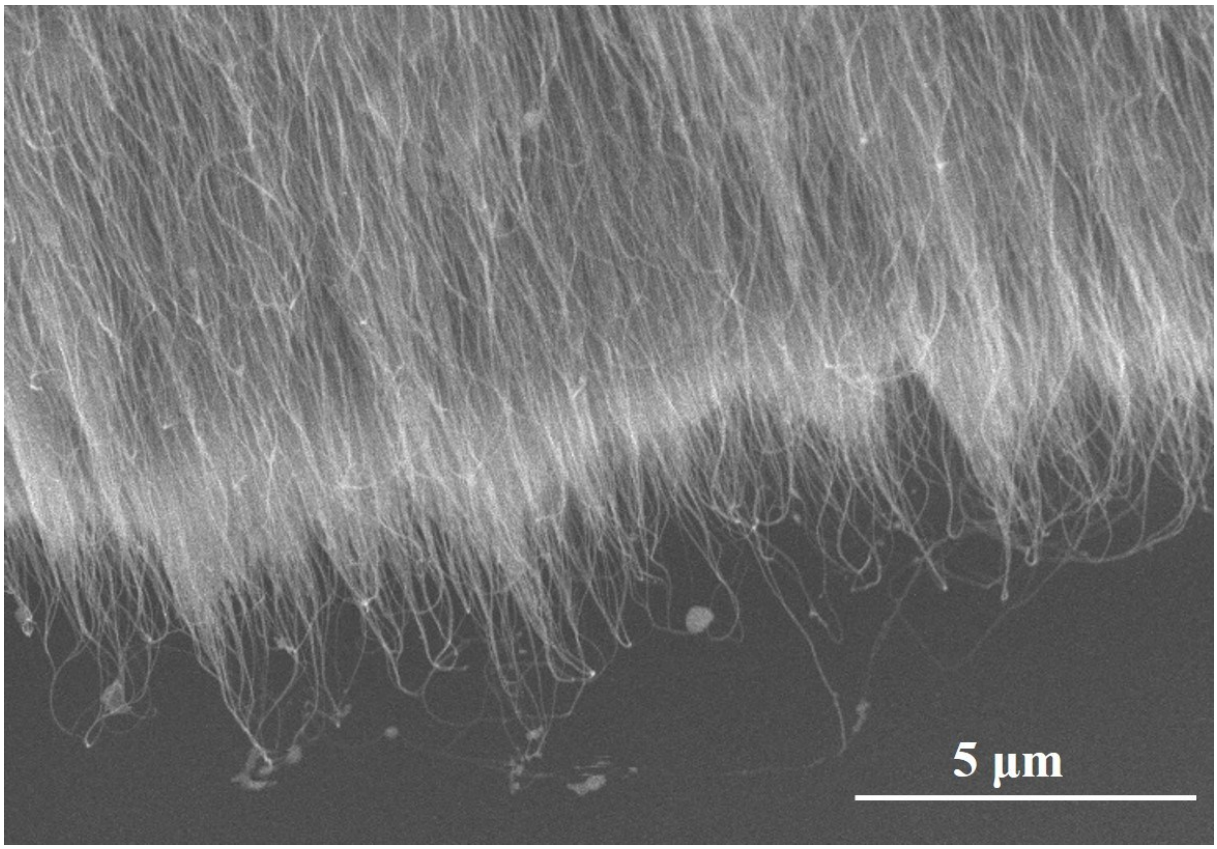

Fig. S2. SEM morphology of fracture surface of ribbon-like fibers after mechanical testing, which indicated that the failure mechanism of the fiber is pulling out of SWNTs.

4. Typical High-resolution transmission electron microscopy image of SWNT ribbon-like fiber.

The ribbon-like fibers (compressed with pressure of 3.7 GPa) were dispersed in ethanol. The dispersions were sonicated for 10 minutes and a drop of the dispersions were dripped on the copper grid. Fig. S3 is a typical HRTEM image. It can be clearly seen that most of the SWNTs are in bundles and a few isolated individual SWNTs remain as the white arrows indicate. This result indicates that after the pressure treatment, the SWNTs are not transformed into other carbon materials.

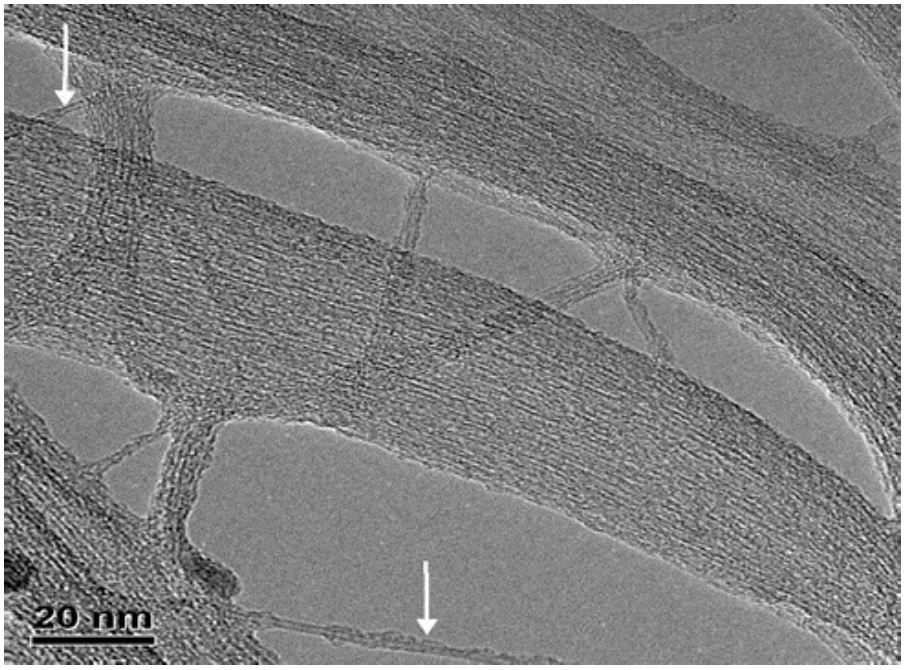

Fig. S3. Typical high-resolution transmission electron microscopy image of SWNT ribbon-like fiber, which is treated with pressure of 3.7 GPa.