**Table S1.** Statistical significance of axial SBR data analysis for electrospun PCL tubular matrices.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.52 | 0.008 | 0.003 | 0.001 | 0.010 |
| 0.01% | | — | 0.025 | 0.014 | 0.008 | 0.043 |
| 0.02% | | | — | 0.298 | 0.138 | 0.936 |
| 0.03% | | | | — | 0.107 | 0.689 |
| 0.04% | | | | | — | 0.333 |
| 0.05% | | | | | | — |

**Table S2.** Statistical significance of circumferential SBR data analysis for electrospun PCL tubular matrices.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.525 | 0.303 | 0.525 | 0.303 | 0.019 |
| 0.01% | | — | 0.109 | 0.014 | 0.008 | 0.014 |
| 0.02% | | | — | 0.378 | 0.012 | 0.066 |
| 0.03% | | | | — | 0.081 | 0.575 |
| 0.04% | | | | | — | 0.747 |
| 0.05% | | | | | | — |

**Table S3.** Statistical significance of axial strain data analysis for electrospun PCL tubular matrices.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.306 | 0.212 | 0.004 | 0.002 | 0.026 |
| 0.01% | | — | 0.100 | 0.027 | 0.003 | 0.027 |
| 0.02% | | | — | 0.005 | 0.008 | 0.128 |
| 0.03% | | | | — | 1.000 | 0.229 |
| 0.04% | | | | | — | 0.100 |
| 0.05% | | | | | | — |

**Table S4.** Statistical significance of circumferential strain data analysis for electrospun PCL tubular matrices.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.088 | 0.034 | 0.044 | 0.022 | 0.026 |
| 0.01% | | — | 0.008 | 0.003 | 0.002 | 0.003 |
| 0.02% | | | — | 0.093 | 0.074 | 0.065 |
| 0.03% | | | | — | 0.617 | 0.721 |
| 0.04% | | | | | — | 0.830 |
| 0.05% | | | | | | — |

**Table 5.** Statistical significance of SBR data analysis for PCL film samples.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.012 | 0.747 | 0.22 | 0.272 | 0.045 |
| 0.01% | | — | 0.137 | 0.003 | 0.003 | 0.002 |
| 0.02% | | | — | 0.077 | 0.019 | 0.028 |
| 0.03% | | | | — | 0.467 | 0.35 |
| 0.04% | | | | | — | 1 |
| 0.05% | | | | | | — |

**Table 6.** Statistical significance of strain data analysis for PCL film samples.

| Test group (SWCNT content, by mass) | Pure PCL | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCL | — | 0.22 | 0.786 | 0.008 | 0.097 | 0.006 |
| 0.01% | | — | 0.307 | 0.0003 | 0.0001 | 0.0004 |
| 0.02% | | | — | 0.003 | 0.018 | 0.0006 |
| 0.03% | | | | — | 0.239 | 0.098 |
| 0.04% | | | | | — | 0.028 |
| 0.05% | | | | | | — |

**Table 7.** Statistical significance of SBR data analysis for PCHC film samples.

| Test group (SWCNT content, by mass) | Pure PCHC | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCHC | — | 0.0001 | 0.836 | 0.127 | 0.002 | 0.0004 |
| 0.01% | | — | 0.0002 | 0.0002 | 0.005 | 0.039 |
| 0.02% | | | — | 0.483 | 0.012 | 0.0003 |
| 0.03% | | | | — | 0.012 | 0.0003 |
| 0.04% | | | | | — | 0.173 |
| 0.05% | | | | | | — |

**Table 8.** Statistical significance of strain data analysis for PCHC film samples.

| Test group (SWCNT content, by mass) | Pure PCHC | 0.01% | 0.02% | 0.03% | 0.04% | 0.05% |
|---|---|---|---|---|---|---|
| Pure PCHC | — | 0.26 | 0.836 | 0.201 | 0.591 | 0.433 |
| 0.01% | | — | 0.365 | 0.003 | 0.799 | 0.158 |
| 0.02% | | | — | 0.307 | 0.169 | 0.86 |
| 0.03% | | | | — | 0.018 | 0.597 |
| 0.04% | | | | | — | 0.149 |
| 0.05% | | | | | | — |
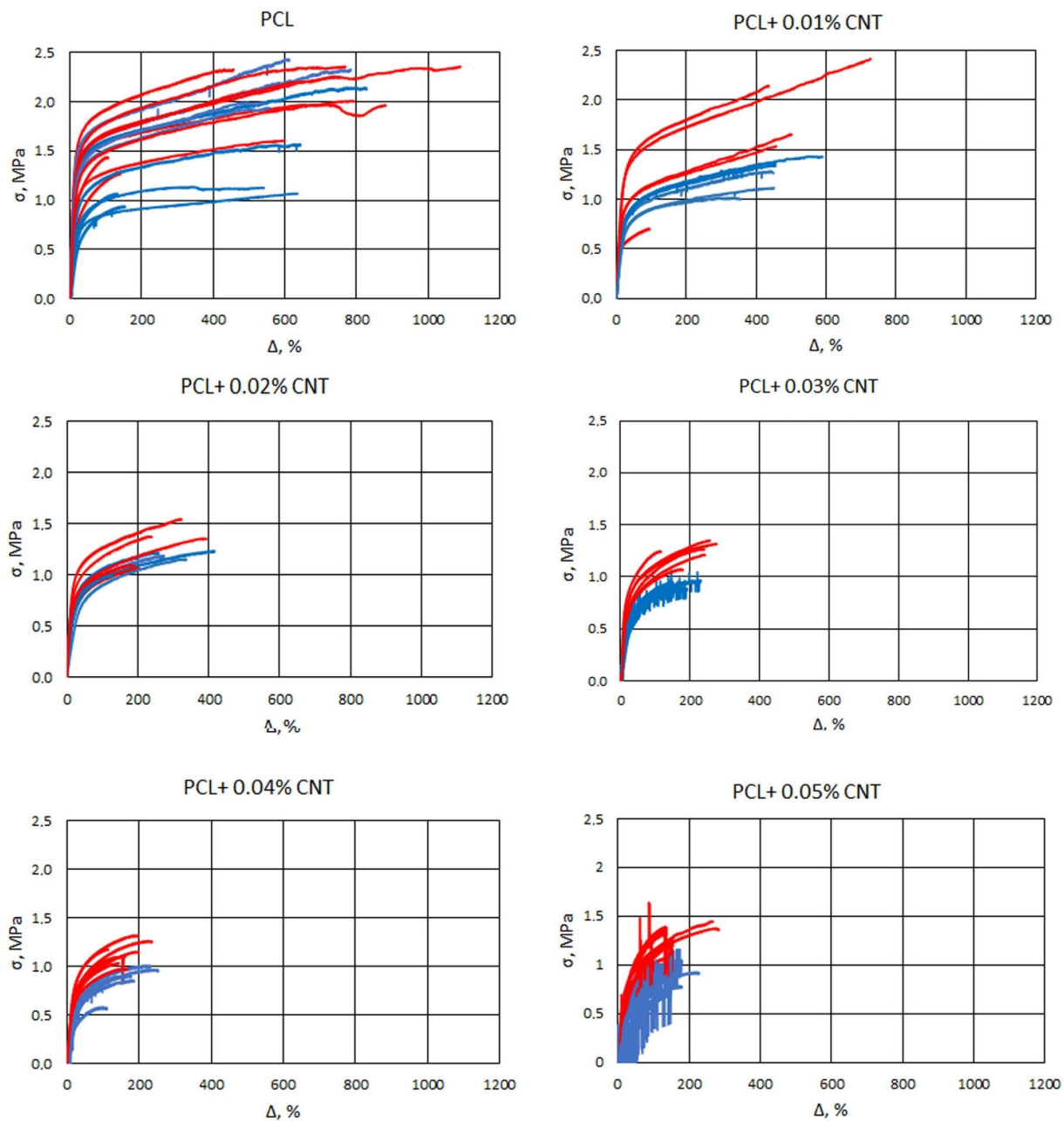
**Supplementary figure 1.** Strain/stress curves of tested electrospun scaffolds, by SWCNT concentration. Red lines indicate plotting in the axial direction; blue curves correspond to circumferential stretching.
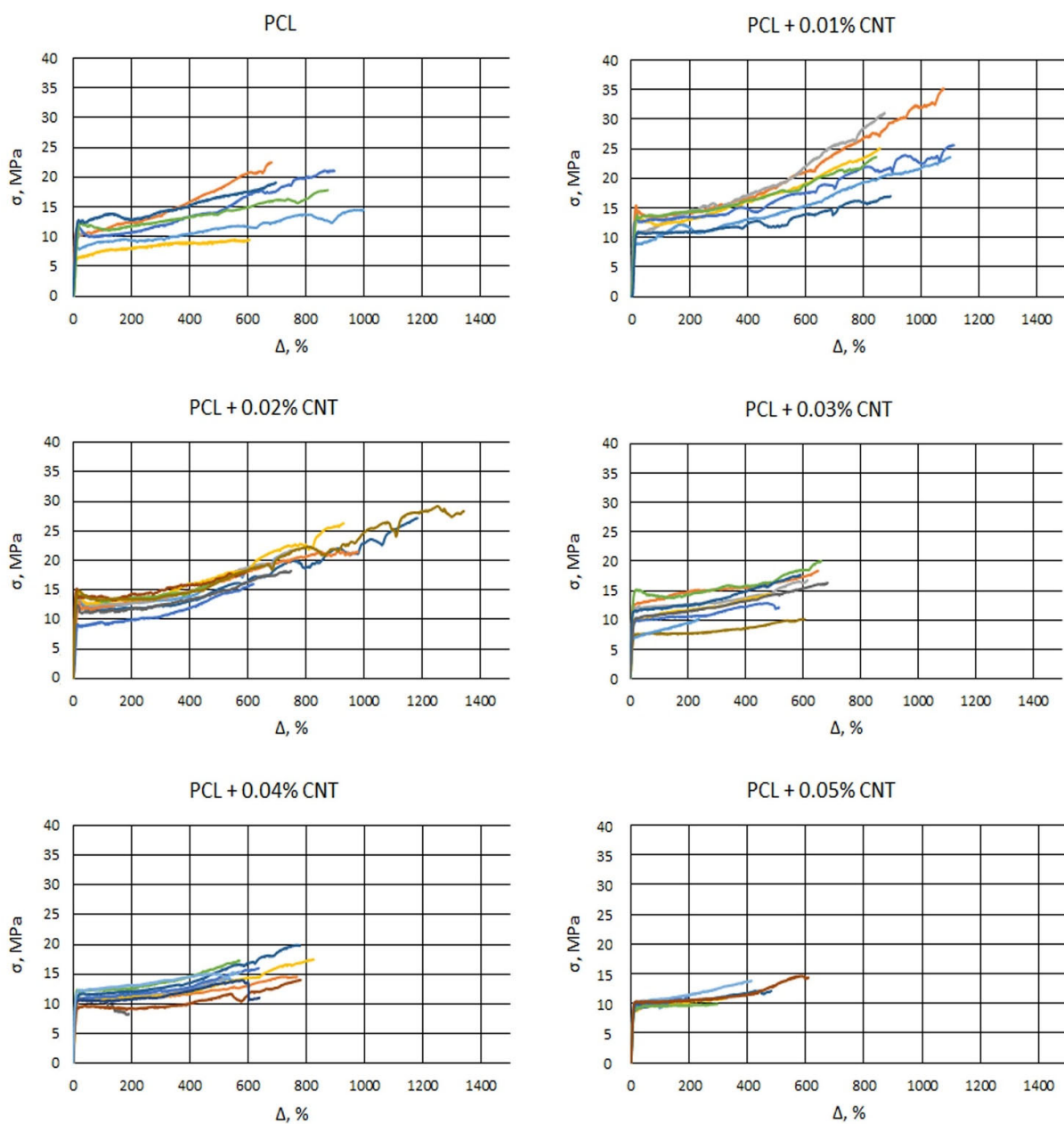
**Supplementary figure 2.** Strain/stress curves of tested PCL films; different colors indicate different samples.
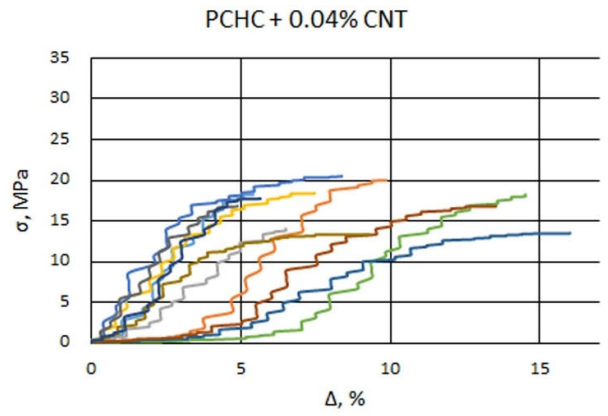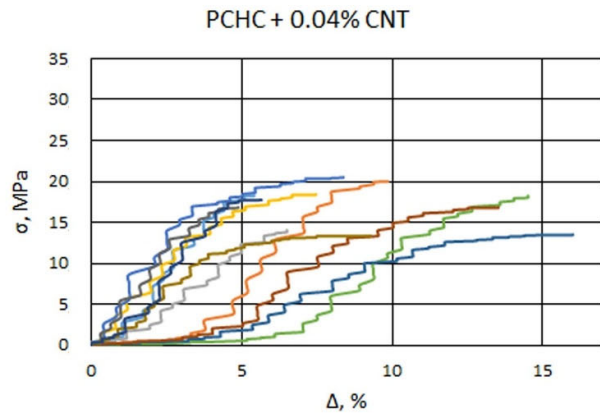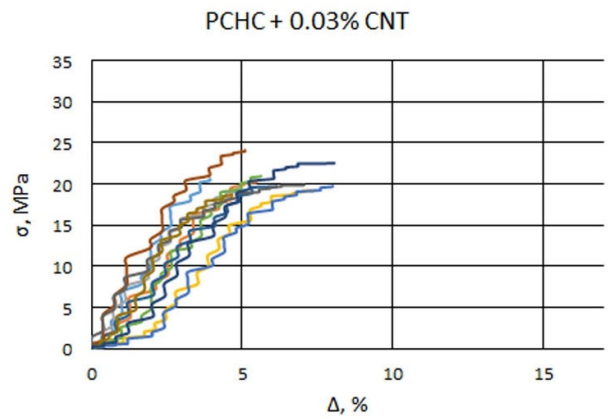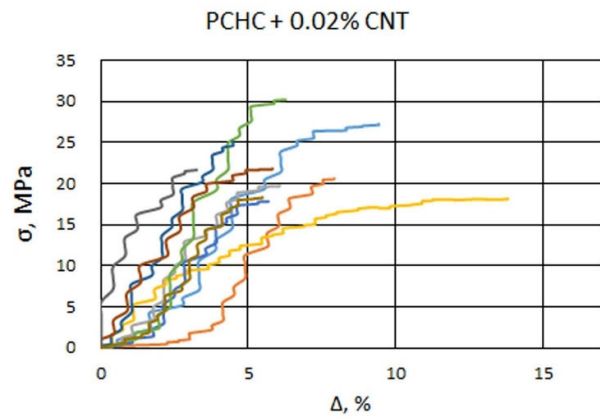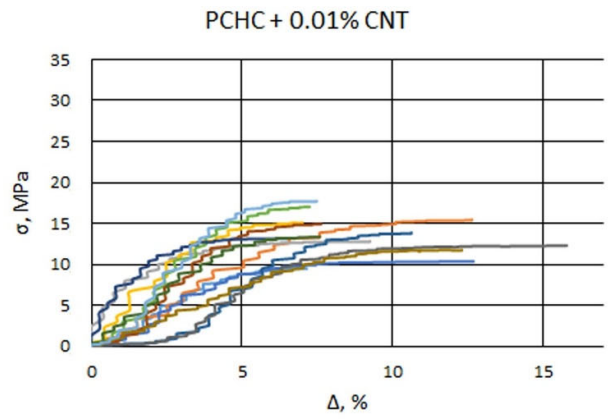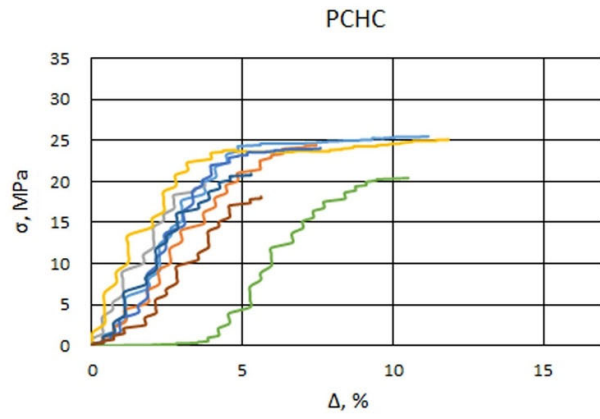
**Supplementary figure 3.** Strain/stress curves of tested PCHC films; different colors indicate different samples.