

Figure S1. - PPE/HDPE/20:80/ 1 wt% CNT at 10min.

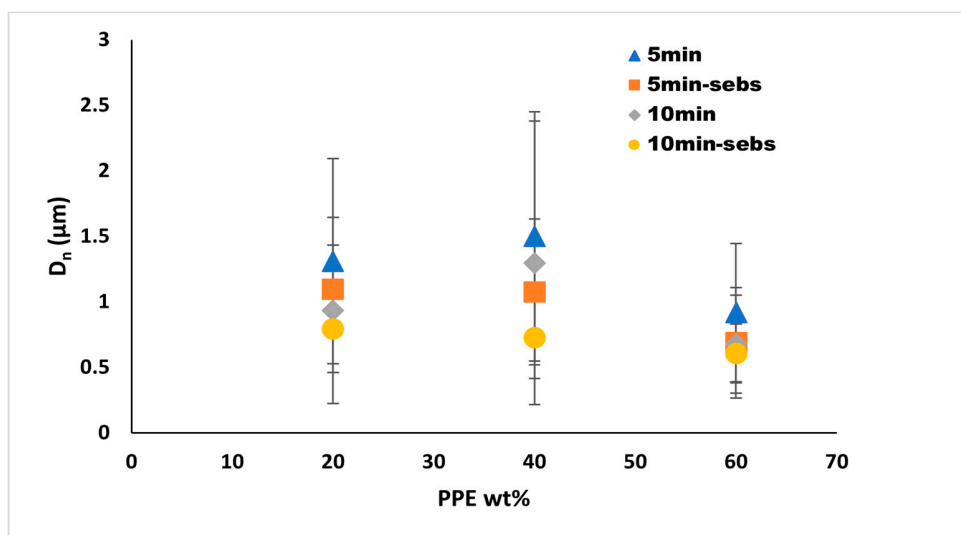


Figure S2. – Domain sizes of PPE, with and without SEBS.

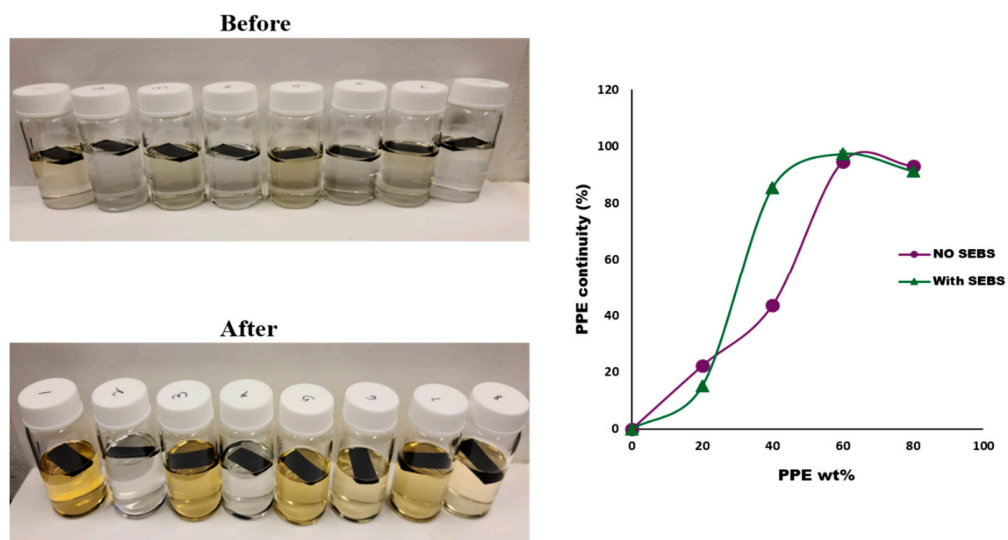


Figure S3 - Solvent extraction of PPE using chloroform.

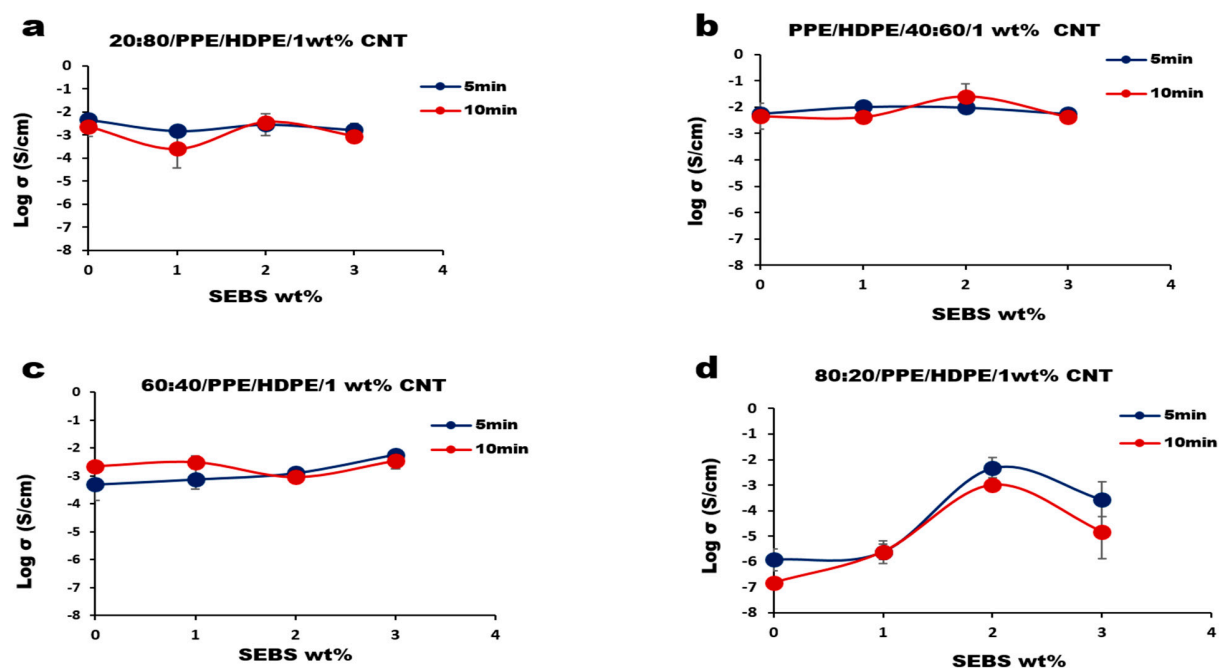


Figure S4 - Electrical conductivity at different Copolymer composition and different blend composition

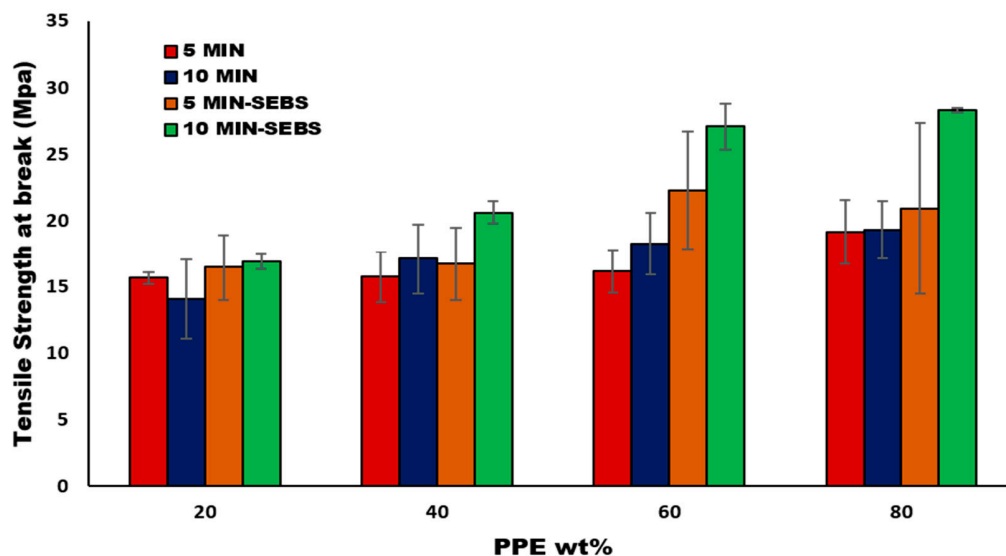


Figure S5. Strength at break of the polymer blend nanocomposites at 1wt% CNT

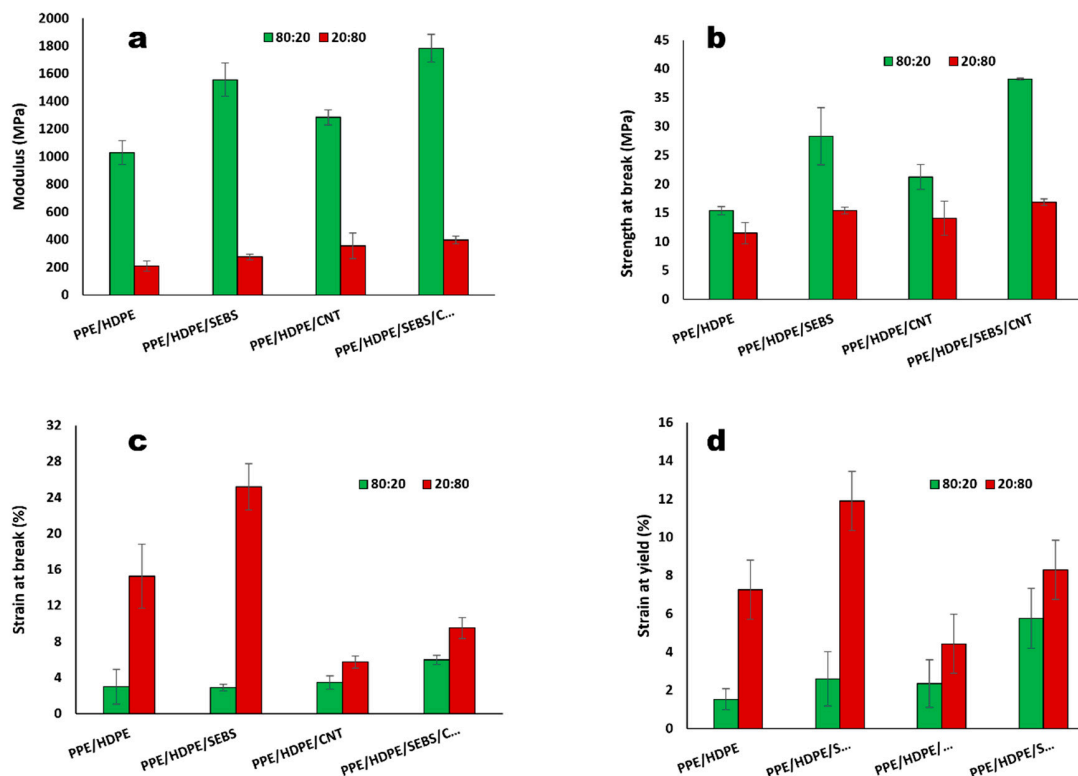


Figure S6. a) Modulus, b) Strength at break, c) elongation at break and d) elongation at yield of the different polymer blend samples at 80:20 and 20:80 composition.

File S1. The Young's equation [1] for calculation of wettability parameter (ω) in PPE/HDPE blend:

$$\omega_{AB} = \frac{\gamma_{polymerB-filler} - \gamma_{polymerA-filler}}{\gamma_{polymerA-polymerB}} \quad \text{Eq. S1}$$

$\omega_{AB} > 1$ Filler localizes within polymer A

$\omega_{AB} < -1$ Filler is within polymer B.

$-1 < \omega_{AB} < 1$ Filler distributes at the interface.

The geometric and harmonic mean developed by Wu [2]

$$\gamma_{AB} = \gamma_A + \gamma_B - 2 \left[\sqrt{\gamma_A^d \gamma_B^d} + \sqrt{\gamma_A^p \gamma_B^p} \right] \quad \text{Eq. S2}$$

$$\gamma_{AB} = \gamma_A + \gamma_B - 4 \left[\frac{\gamma_A^d \gamma_B^d}{\gamma_A^d + \gamma_B^d} + \frac{\gamma_A^p \gamma_B^p}{\gamma_A^p + \gamma_B^p} \right] \quad \text{Eq. S3}$$

Table S1. Geometric and Harmonic mean values of PPE/HDPE, PPE/MWCNT and HDPE/MWCNT

Interfacial tensions	Geometric	Harmonic
$\gamma_{PPE/HDPE}$	6.2	6.2
$\gamma_{PPE/MWCNT}$	0.76	1.51
$\gamma_{HDPE/MWCNT}$	10.45	10.69
wettability	1.56	1.48

Reference

- [1] M. Sumita, K. Sakata, S. Asai, K. Miyasaka, and H. Nakagawa, "Dispersion of fillers and the electrical conductivity of polymer blends filled with carbon black," *Polym. Bull.*, vol. 25, no. 2, pp. 265–271, 1991, doi: 10.1007/BF00310802.
- [2] S. Wu, "Calculation of interfacial tension in polymer systems," *J. Polym. Sci. Part C Polym. Symp.*, vol. 34, no. 1, pp. 19–30, 2007, doi: 10.1002/polc.5070340105.