Supplementary Materials: Metamaterial Behavior of Polymer Nanocomposites Based on Polypropylene/Multi-Walled Carbon Nanotubes Fabricated by Means of Ultrasound-Assisted Extrusion


Four different fabrication methods were used to fabricate the polymer nanocomposites: W-U (without ultrasound), F-U (fixed-frequency ultrasound-assist fabrication), V-U (variable-frequency ultrasound-assist fabrication), and PT (pretreatment of MWCNT in a fluidized air-bed with an ultrasound probe).

Figure S1. $\varepsilon''$ for (a) iPPMFI=2.5/MWCNT; (b) iPPMFI=34/MWCNT; and (c) iPPMFI=120/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S2. Tan δ for (a) iPPMFI=2.5/MWCNT; (b) iPPMFI=34/MWCNT; and (c) iPPMFI=1200/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S3. Nyquist plots for (a) iPPMFI=2.5/MWCNT; (b) iPPMFI=34/MWCNT; and (c) iPPMFI=1200/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S4. $M'$ for (a) iPP$_{MFI=25}$/MWCNT; (b) iPP$_{MFI=34}$/MWCNT; and (c) iPP$_{MFI=120}$/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S5. $M''$ for (a) iPP$_{MFI=2.5}$/MWCNT; (b) iPP$_{MFI=34}$/MWCNT; and (c) iPP$_{MFI=120}$/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S6. Electrical modulus complex plane ($M''$ vs. $M'$) for (a) iPPMFI=2.5/MWCNT; (b) iPPMFI=34/MWCNT; and (c) iPPMFI=120/MWCNT fabricated using different ultrasound-assisted extrusion methods.
Figure S7. TEM micrographs of MWCNTs. (a) Lower magnifications; (b) Higher magnifications.