

# Influence of CNT Length on Dispersion, Localization, and Electrical Percolation in a Styrene-Butadiene-Based Star Block Copolymer

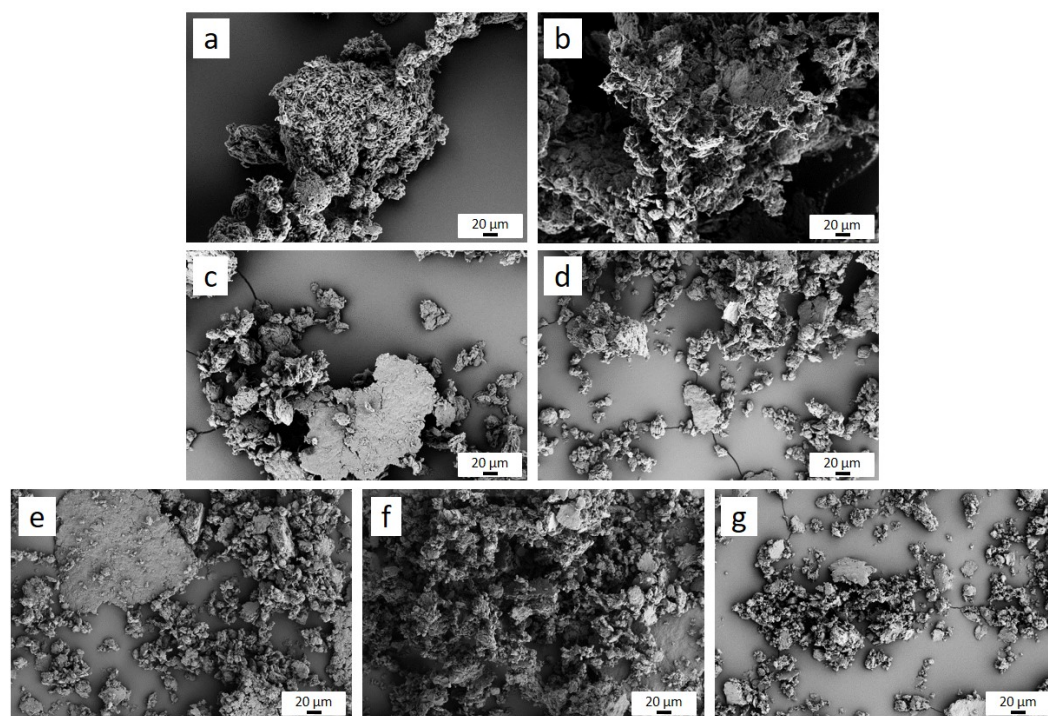
Ulrike Staudinger <sup>1,\*</sup>, Andreas Janke <sup>1</sup>, Christine Steinbach <sup>1</sup>, Uta Reuter <sup>1</sup>, Martin Ganß <sup>2</sup> and Oliver Voigt <sup>1,†</sup>

<sup>1</sup> Leibniz-Institut für Polymerforschung Dresden e.V., Hohe Str. 6, 01069 Dresden, Germany; andy@ipfdd.de (A.J.); steinbach@ipfdd.de (C.S.); reuter@ipfdd.de (U.R.); oliver.voigt@mvtat.tu-freiberg.de (O.V.)

<sup>2</sup> Material Research and Testing Institute (MFPA) at the Bauhaus-Universität Weimar, Coudraystraße 9, 99423 Weimar, Germany; martin.ganss@mfpa.de

\* Correspondence: staudinger@ipfdd.de; Tel.: +49-351-4658-646

† Current Address: Institut Mechanische Verfahrenstechnik und Aufbereitungstechnik, Technische Universität Bergakademie Freiberg, Agricolastraße 1, 09599 Freiberg, Germany.

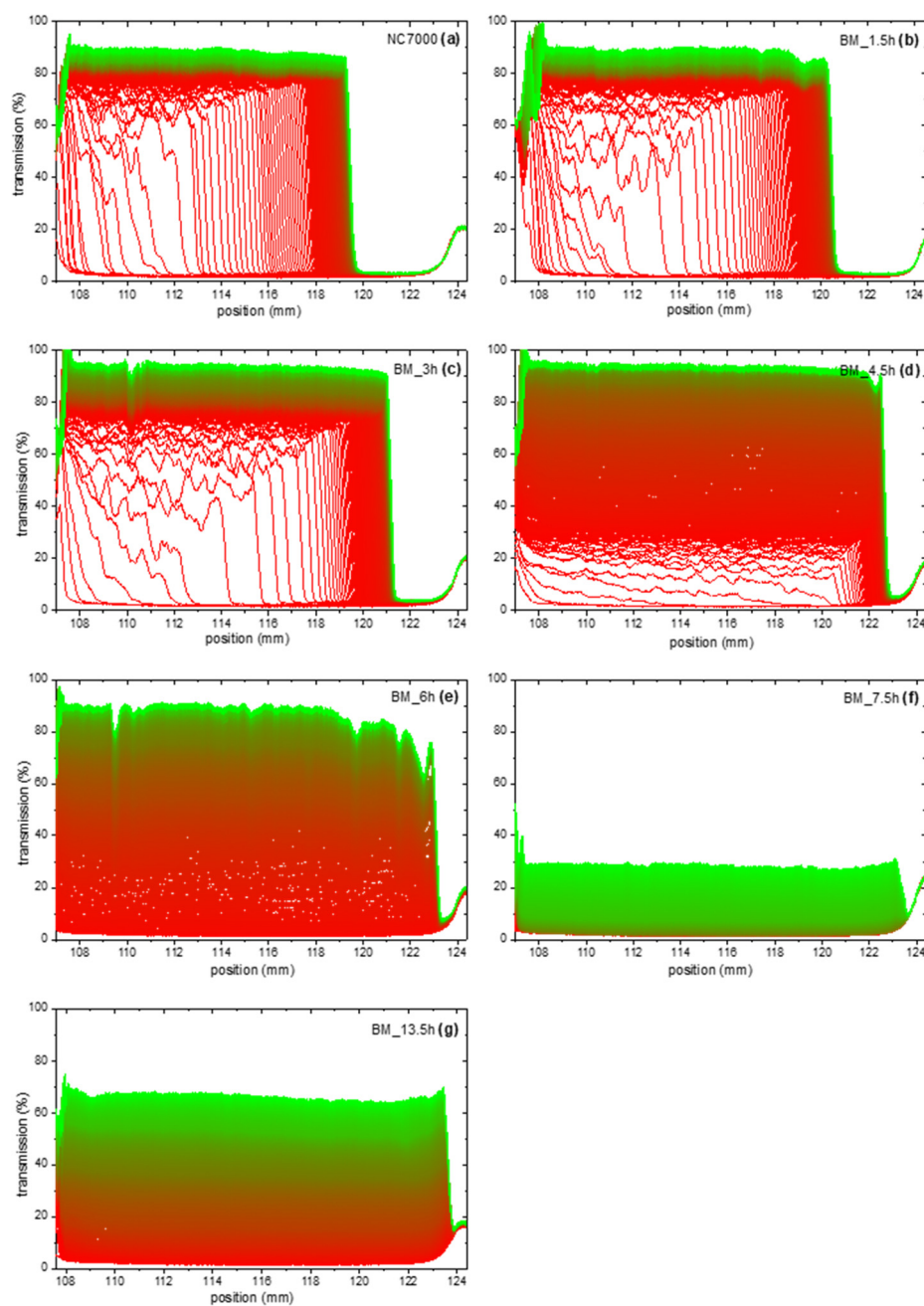


**Figure S1.** SEM images of CNT powders: neat NC7000 (a) and CNTs ground for 1.5 h (b), 3 h (c), 4.5 h (d), 6 h (e), 7.5 h (f) and 13.5 h (g)

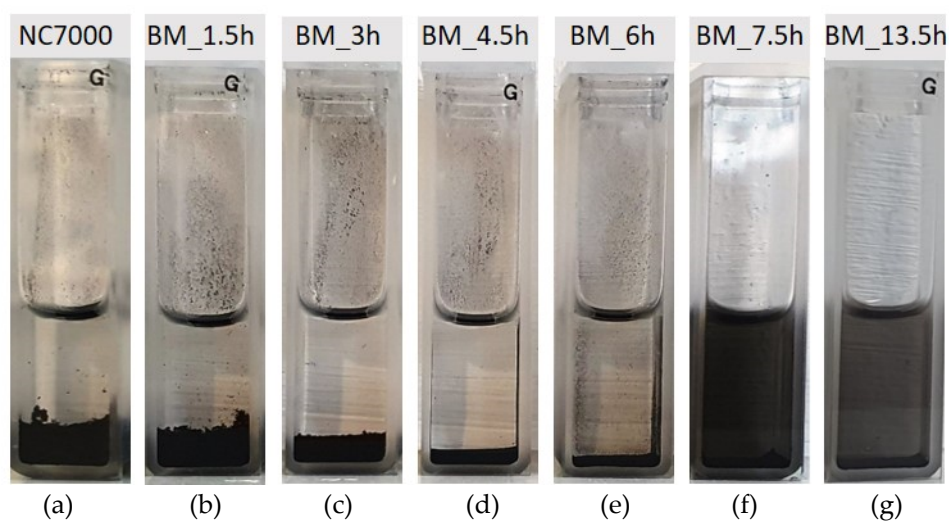
**Table S1.** Polydispersity index (PDI) and particle size distribution of grinded CNTs, measured by DLS.

| Sample       | No. | PDI   | Intensity*     |                 | Volume*        |                 | Number*        |                 |
|--------------|-----|-------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
|              |     |       | size d<br>(nm) | fraction<br>(%) | size d<br>(nm) | fraction<br>(%) | size d<br>(nm) | fraction<br>(%) |
| CNT_BM_6h    | a   | 0.647 | 983.3          | 88.9            | 1021           | 97.0            | 939.8          | 9.3             |
|              |     |       | 142.8          | 11.1            | 145.2          | 3.0             | 140.1          | 90.7            |
|              | b   | 0.738 | 1051           | 84.2            | 1134           | 94.7            | 951.8          | 7.9             |
|              |     |       | 171.4          | 15.8            | 181.7          | 5.3             | 163.7          | 92.1            |
|              | c   | 0.594 | 1232           | 88.3            | 1307           | 97.2            | 1168           | 7.9             |
|              |     |       | 163.6          | 11.7            | 167.8          | 2.8             | 161.4          | 92.1            |
|              | d   | 0.557 | 1239           | 86.3            | 1313           | 96.2            | 1174           | 7.3             |
|              |     |       | 177.1          | 13.7            | 183.6          | 3.8             | 173.7          | 92.7            |
| CNT_BM_7.5h  | a   | 0.662 | 1102           | 90.0            | 1187           | 95.1            | 1008           | 16.8            |
|              |     |       | 232.2          | 10.0            | 241.7          | 4.9             | 228.5          | 83.2            |
|              | b   | 0.696 | 1074           | 92.6            | 1144           | 96.8            | 998.5          | 20.6            |
|              |     |       | 213.0          | 7.4             | 220.3          | 3.2             | 210.2          | 79.4            |
| CNT_BM_13.5h | a   | 0.750 | 669.7          | 100.0           | 674.0          | 100.0           | 663.1          | 100.0           |
|              | b   | 0.605 | 702.6          | 100.0           | 709.7          | 100.0           | 678.5          | 100.0           |
|              | c   | 0.711 | 758.3          | 100.0           | 772.1          | 100.0           | 729.9          | 100.0           |

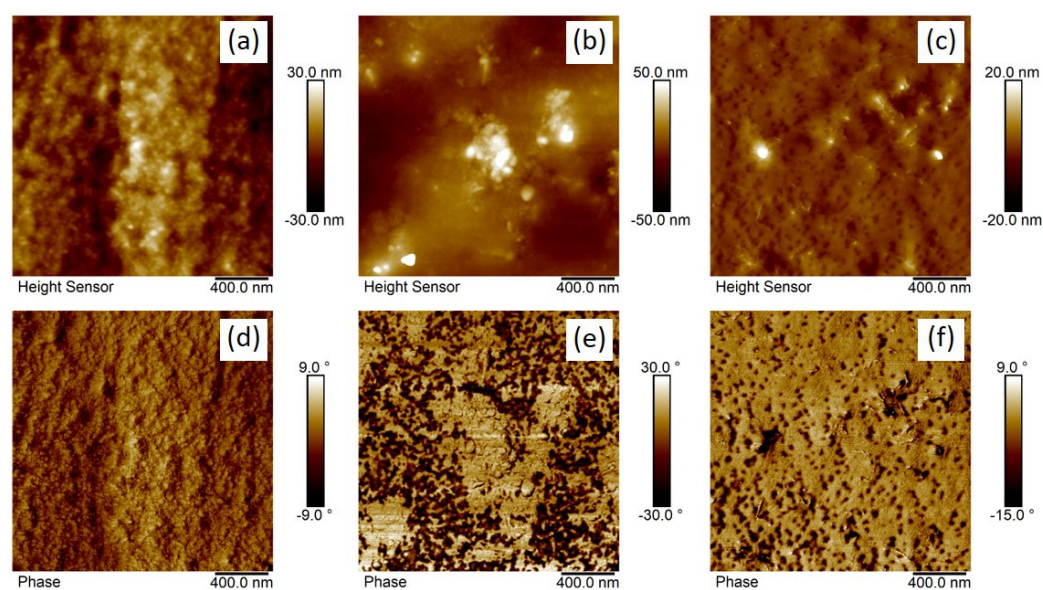
\*Distribution analysis



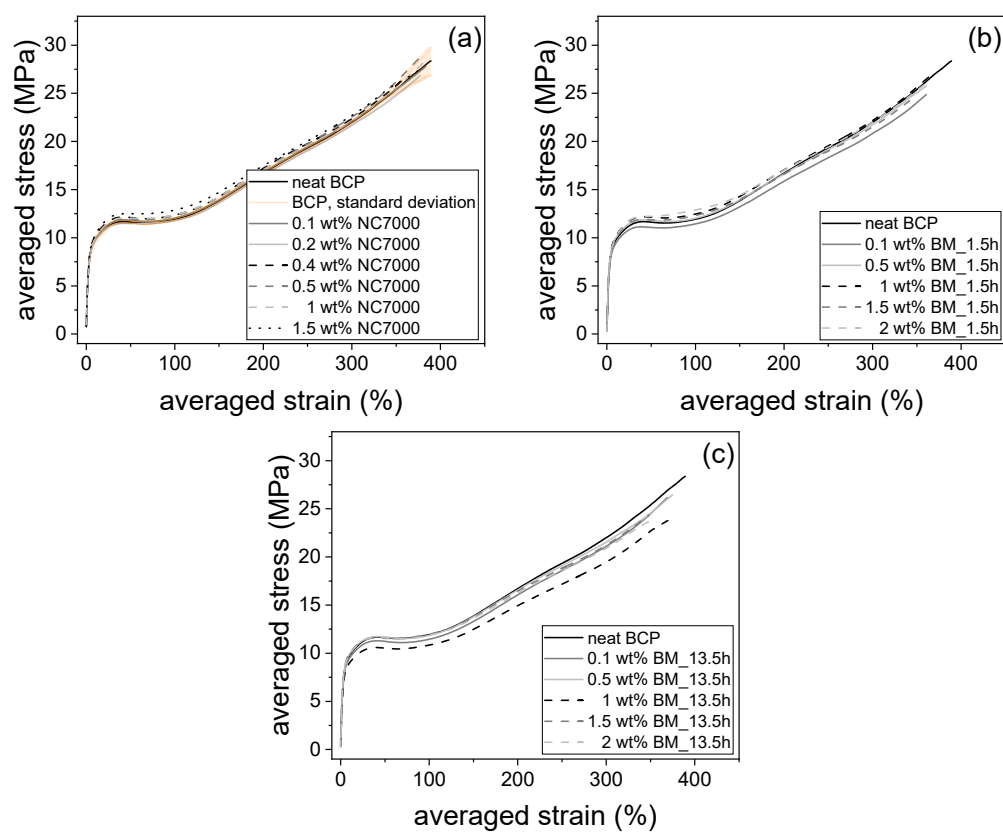
**Figure S2.** Transmission profiles of BCP/CNT dispersions for various CNT size fractions: neat NC 7000 (a) and CNTs grinded for 1.5 h (b), 3 h (c), 4.5 h (d), 6 h (e), 7.5 h (f) and 13.5 h (g); measured using Centrifugal Separation Analyzer for characterizing the sedimentation behavior of CNTs in BCP/toluene solution



**Figure S3.** Photographs of BCP/CNT dispersions after centrifugation containing 1 wt% of neat NC7000 (a) and CNTs grinded for 1.5 h (b), 3 h (c), 4.5 h (d), 6 h (e), 7.5 h (f) and 13.5 h (g)



**Figure S4.** AFM height and phase images of neat BCP (a,d), BCP with 1 wt% NC7000 (b,e) and BCP with 1 wt% BM\_6h (c,f), respectively



**Figure S5.** Averaged stress-strain diagrams of BCP/CNT composites containing various filler content of NC7000 (a), BM\_1.5h (b) and BM\_13.5h (c)