Electronic Supplementary Material (ESI) for RSC Advances


**Supporting Information for**

# Highly Conductive and Stretchable Poly(dimethylsiloxane): Poly(3,4-ethylenedioxythiophene):Poly(styrene sulfonic acid) Blends for Organic Interconnects

Jin-Seo Noh*

*Department of Nano-Physics, Gachon University, 1342 Seongnamdaero, Seongnam-si, Gyeonggi-do 461-701, Korea*

*Author to whom correspondence should be addressed: Jin-Seo Noh: e-mail: jinseonoh@gachon.ac.kr, phone: +82 317505611

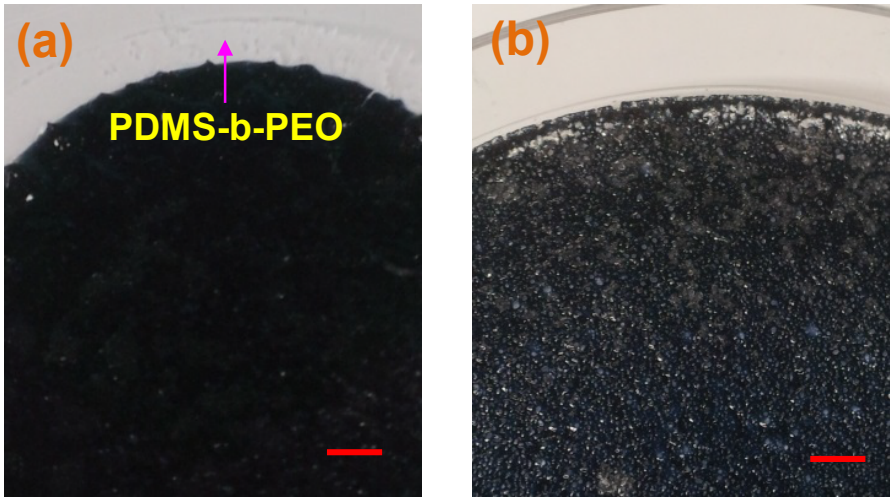



**Figure S1**. Photographs of polymer blend films consisting of (a) a 200% PEDOT:PSS, a 100% PDMS, and a 40% PDMS-b-PEO, and (b) a 300% PEDOT:PSS, a 100% PDMS, and a 30% PDMS-b-PEO, respectively. It is found from (a) that a PDMS-b-PEO phase is separated from the main blend film at this excess concentration of PDMS-b-PEO. (b) shows a higher concentration of PEDOT:PSS does not improve the film uniformity. Scale bars 5 mm.

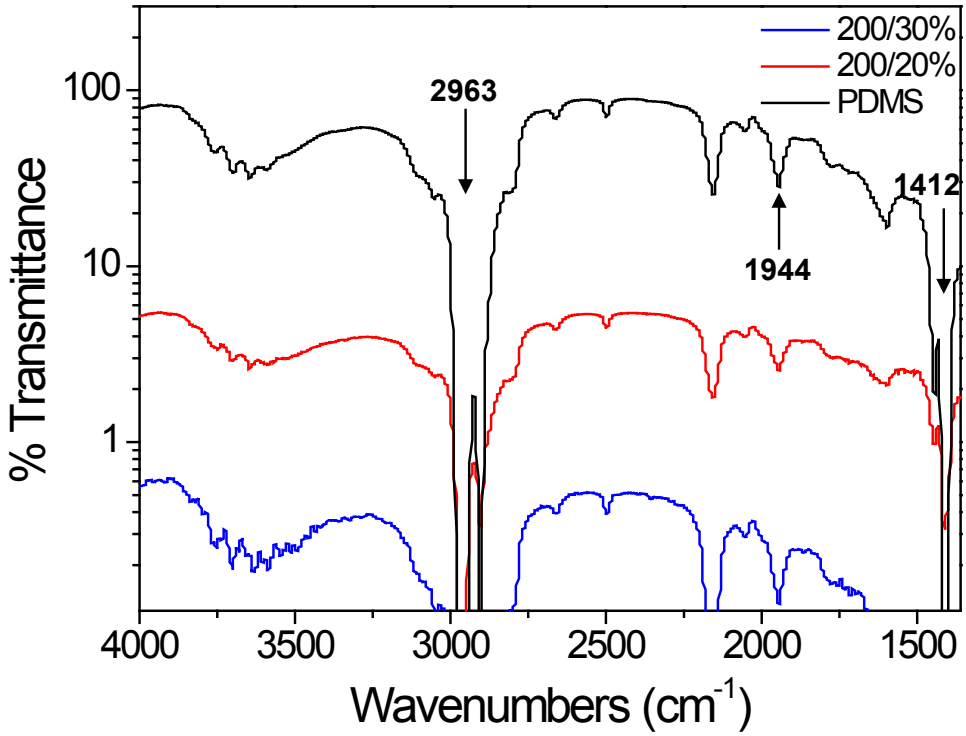
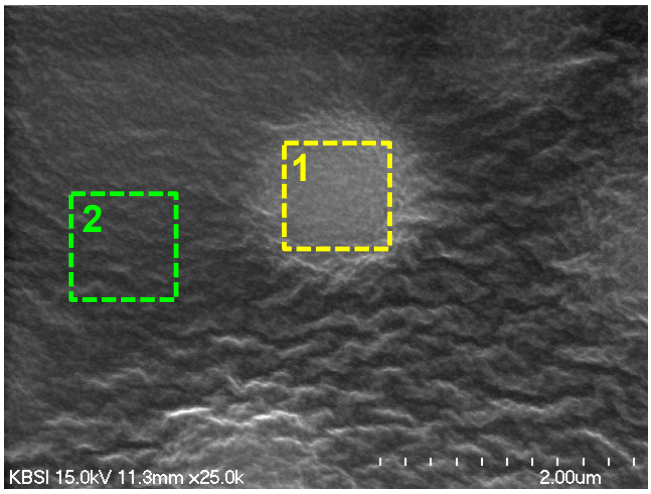



**Figure S2**. PEDOT:PSS:PDMS blend films show FT-IR profiles similar to that of a PDMS film, irrespective of the concentration of PDMS-b-PEO. This reflects that the blend films keep the main attributes of the PDMS film, thereby reinforcing their mechanical properties. The peaks at 2963 and 1412 $cm^{-1}$ correspond to CH stretching of $CH_3$ groups and $CH_3$ asymmetric deformation of Si-$CH_3$ bonds, respectively.




| Element | Atomic % (1) | Atomic % (2) |
|---|---|---|
| C | 63.22 | 69.76 |
| O | 30.75 | 23.31 |
| Si | 5.01 | 5.43 |
| S | 1.02 | 1.51 |

**Figure S3**. SEM image taken from another location on the same sample as in Fig. 4. Nano- or micro-structures are very similar to those discussed in the main text, which are composed of hairy ball-like domains and ruffled sea surrounding them. Atomic fractions obtained from the two distinct areas also resemble those of Fig. 4.

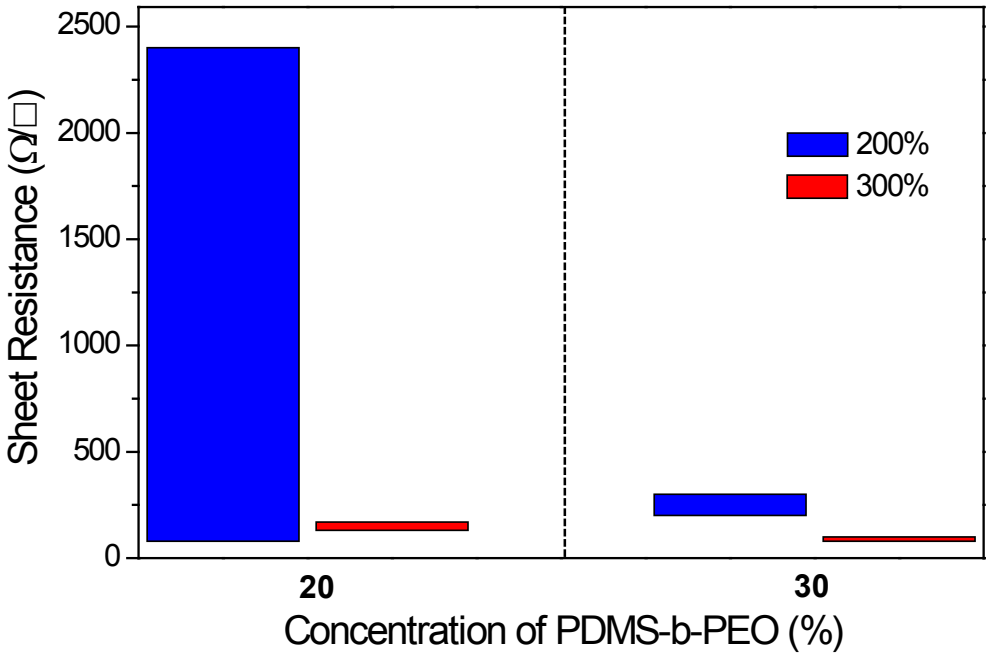



**Figure S4**. The sheet resistance of a polymer blend film is drastically reduced when the concentration of PEDOT:PSS increases. However, the increased PEDOT:PSS concentration is apt to weaken the mechanical property of the polymer blend as evidenced by Fig. 5(c), thus an optimal composition should be determined by a trade-off between electrical and mechanical properties.

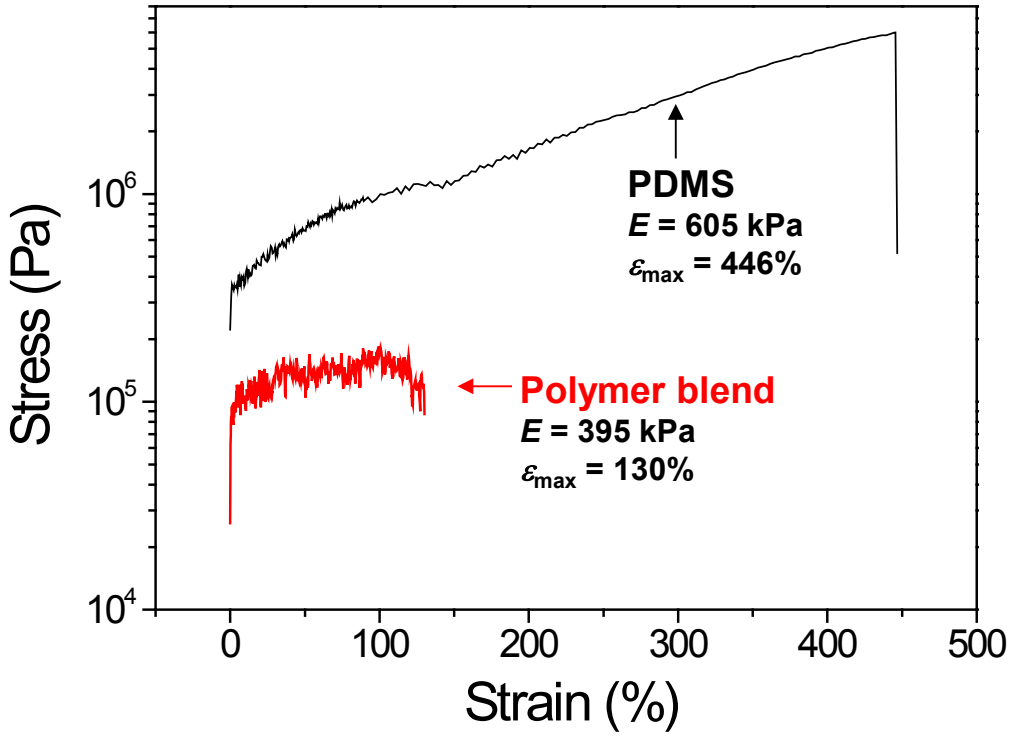



**Figure S5**. Tensile test results for a polymer blend film and a pure PDMS sheet. The composition of the blend film was same as that of a film with the largest rupturing strain (~75%) in Fig. 5(c). Due to the incorporation of a large amount of PEDOT:PSS, which is mechanically weak, the mechanical properties of the blend film is deteriorated compared to pure PDMS sheet.

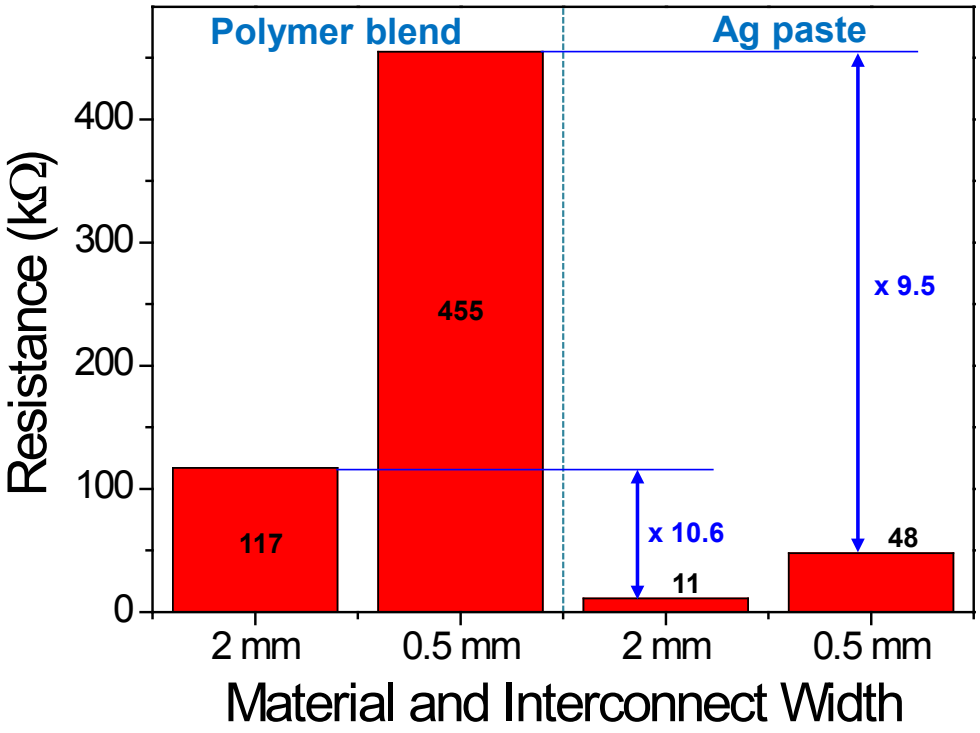



**Figure S6**. The resistance of a polymer blend interconnect appears to be about an order of magnitude higher than that of a control interconnect made of a Ag paste. This difference is originated from the conductivity difference of the two materials.