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Polydimethylsiloxanes (PDMS) are well-known to actuate with relatively large strains due to low modulus, but they possess low permittivity. Contrary, polyethyleneglycols (PEG) are not stretchable but possess high permittivity. Combination of the two polymers in a block copolymer depicts a possibility for substantial improvement of properties such as high permittivity, stretchability and non-conductivity – if carefully designed. The objective is to synthesize PDMS-PEG multiblock copolymer assembling into discontinuous morphologies in PEG based on variation of volume fractions of PDMS. The utilized synthesis of PDMS-PEG multiblock copolymer is based on hydrosilylation reaction, which is amended from Klasner et al.[1] and Jukarainen et al.[2] Variation in the ratio between the two constituents introduces distinctive properties in terms of dielectric permittivity and rheological behaviour. PDMS-PEG multiblock copolymers are, however, shown to be conductive (***figure 1.a***) and thus not capable of actuating. By incorporating conductive PDMS-PEG multiblock copolymers into commercial PDMS elastomer, the discontinuity in PEG can be obtained and the relative permittivity (ε') is significantly enhanced 60% with 5wt% of PDMS-PEG block copolymer incorporated in the PDMS network (***figure 1.b***).

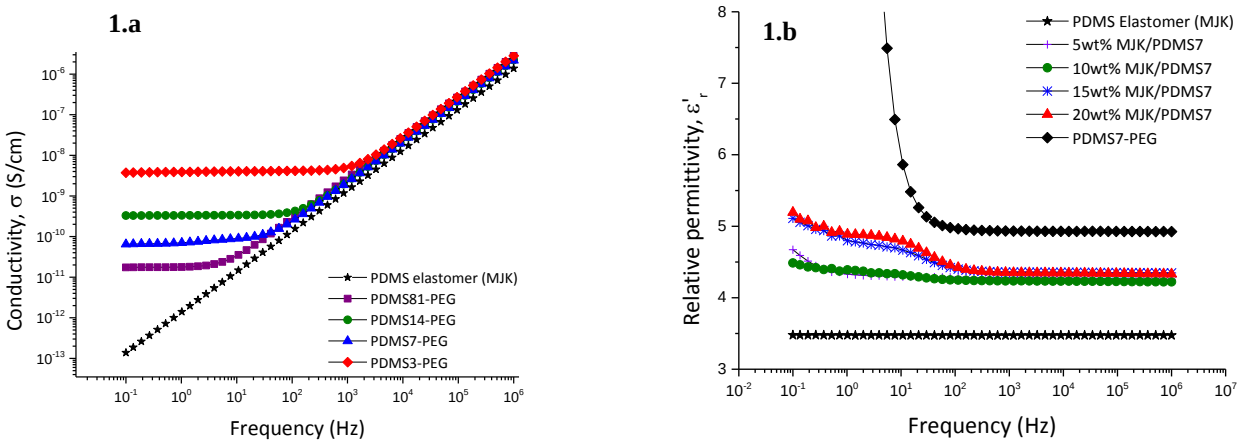

Figure 1: a) The conductivity of PDMS-PEG multiblock copolymers at 23 °C. **b**) The relative permittivity of polymer blends MJK/PDMS7 at 23 °C.

Note: PDMS3-PEG ~ *PDMS (m = 3) & PEG (n = 4)* PDMS7-PEG ~ *PDMS (m = 7) & PEG (n = 4)*
PDMS14-PEG ~ *PDMS (m = 14) and PEG (n = 4)* PDMS81-PEG ~ *PDMS (m = 81) and PEG (n = 4)*
MJK/PDMS7 ~ Polymer blends of commercial PDMS elastomer (MJK) and block copolymer of PDMS7-PEG

References

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