Electro-mechanical actuation performance of SEBS/PU blends

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Dielectric elastomers have been regarded as truly artificial muscles for their electro-mechanical (EM) actuation performance. However, they require large driving voltages to present adequate actuation strains. The main pursued route to solve it has been the development of elastomeric composites with high dielectric permittivity. Unfortunately, such approach reinforces the matrix and has a detrimental effect on the EM actuation and the dielectric breakdown strength. Here, we study a complementary strategy to improve the dielectric permittivity without increasing its stiffness. We analyze the effect of thermoplastic PU elastomer on the actuation response of a thermoplastic dielectric elastomer, such as poly(styrene-ethylene-butadiene-styrene). The addition of 10 wt% PU resulted in an improved EM actuation without reducing its dielectric breakdown strength. This result was ascribed to the interaction of the urethane hard segments of the PU and the styrene moieties of the SEBS. The results revealed that DEAs can be developed through a simple blending procedure, where a proper selection of the polymer systems is key for their actuation performance.