Glycerol as high-permittivity liquid filler in dielectric silicone elastomers

A recently reported novel class of elastomers was tested with respect to its dielectric properties. The new elastomer material is based on a commercially available poly(dimethylsiloxane) composition, which has been modified by embedding glycerol droplets into its matrix. The approach has two major advantages that make the material useful in a dielectric actuator. First, the glycerol droplets efficiently enhance the dielectric constant, which can reach astonishingly high values in the composite. Second, the liquid filler also acts as a softener that effectively decreases the elastic modulus of the composite. In combination with very low cost and easy preparation, the two property enhancements lead to an extremely attractive dielectric elastomer material. Experimental permittivity data are compared to various theoretical models that predict relative permittivity changes as a function of filler loading, and the applicability of the models is discussed.

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