



PROGRAMUL DE COOPERARE ELVEȚIANO-ROMÂN
SWISS-ROMANIAN COOPERATION PROGRAMME

Energy harvesting by dielectric elastomer generators

Starting Date 01.01.2014
Duration 36 Months
Discipline 20507 Chemical Engineering

Main Goals

The main goals of this project is to develop novel silicone elastomers materials with high permittivity and good elastic properties to be used as dielectric in dielectric elastomer generators.

Activities

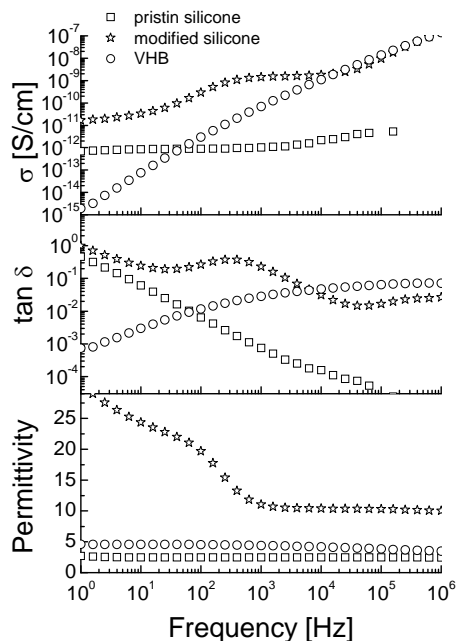
Dielectric elastomer generators (DEG) are stretchable capacitors that convert mechanical energy into more useful electrical energy. When strained by an external force, charged in this strained form and let contract by the elastic restoring forces, the like charges on the electrodes are squeezed together while the distance between the unlike charges is increased. These results in an increase of the voltage of the charge and thus mechanical energy can be converted into electrical energy. Unfortunately, the existing materials have insufficient performance which limits the application potential of this technology. It is the aim of this project to develop new materials for DEG. New silicone based elastomeric materials with increased dielectric constant, low dielectric losses, low conductivity, and good mechanical properties will be prepared. In order to increase the dielectric constant, polar groups will be attached to the silicone chains.

Expected results

D. M. Opris, S. Dünki, C. Racles, M. Cazacu, A. Bele, "High permittivity polymers based on functionalized silicones", Patent application filed in **2014**.
C. Racles, M. Cazacu, B. Fischer, D. M. Opris, *Smart. Mater. Struct.* **2013**, *22*, 104004.
C. Racles, M. Alexandru, A. Bele, V. E. Musteata, M. Cazacu, D. M. Opris, *RSC Adv.* **2014**, *4*, 37620.
S. J. Dünki, M. Tress, F. Kremer, S. Y. Ko, F. A. Nüesch, C. Racles, D. M. Opris, "Fine-tuning of the dielectric properties of polysiloxanes by chemical modification", **2014**, submitted.
S. J. Dünki, Y. S. Ko, F. A. Nüesch, D. M. Opris, "Self-repairable, high permittivity dielectric elastomers with large actuation strains at low electric fields", **2015**, submitted.
C. Racles, A. Bele, M. Alexandru, V. Musteata, C. D. Varganici, D. Ionita, S. Vlad, M. Cazacu, S. Dünki, D. M. Opris, "Polar-nonpolar interconnected elastic networks with increased permittivity and high breakdown fields for dielectric elastomer transducers", in preparation.

Swiss Coordinator

Name: Dorina M. Opris
Department: Advanced Materials and Surfaces
University: Empa
E-Mail Address dorina.opris@empa.ch
Homepage: <http://www.empa.ch>



Romanian Coordinator

Name: Carmen Racles
Department: Inorganic Polymers
University: Petru Poni Institute
E-Mail Address raclesc@icmpp.ro
Homepage: <http://www.icmpp.ro>