ID de Contribution: **20** Type: **Poster presentation**

PVDF nanostructuration, piezocomposites synthesis and modeling piezoelectric behaviors

Flexibility and strong polarization of its beta crystalline phase has made the homopolymer PVDF (Polyvinylidene Fluoride) a worldwide studied piezomaterial in the development of piezogenerators and the domain of energy harvesting. The race to achieve the best piezoperformances with this material is on. The actual research trend is focused on developing flexible composite piezomaterials with the aim of increasing notably the piezoelectric constant d33.
SHI irradiations and track-etching on thin piezoPVDF membranes (dozens of microns) enable us to work on the nanostructuration of PVDF and on the elaboration of new composites. From these highly porous PVDF matrices (fluencies of 108-109 cm-2), it is possible to embed inorganic nanowires or MOF (Metal Organic Framework) inside PVDF nanoporosity.
In addition, to better describe the piezoelectric behavior of PVDF we have developed an experimental set-up that stresses the membrane by a sinusoidal strain. The direct sinusoidal piezoresponse of the material is real-time monitored for different frequencies of strains and different load resistances in the electric circuit. Resulted quantitative analysis of datasets enables us to verify our mathematical model derivatized from Curies' constitutive equations. The challenge is to define a figure of merit that can be applied to any piezocomposite. Preliminary results have shown that a scaling law exists between the output voltage and the product of the load resistance by the mechanical solicitation frequency.

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