Contribution ID: **37** Type: **Poster**

Highly sensitive transparent piezoionic materials and their applicability as printable pressure sensors

Friday, 24 September 2021 09:10 (5 minutes)

Hybrid materials based on ionic liquids (ILs) and polymers represent an emerging and interesting approach for an increasing number of applications, including sensors and actuators [1], as it represents a versatile way to produce particle free multifunctional materials with reduced environmental impact.
In this work, transparent piezoionic hybrid materials based on a thermoplastic elastomer styrene-ethylene-butylene-styrene (SEBS) containing 20 wt.% of the IL 1-butyl-3-methylimidazolium dicyanamide ([Bmim][N(CN)2]), suitable for pressure sensing applications, were prepared by the solvent casting method. The morphology, physico-chemical, electric, and electromechanical properties were evaluated.
The incorporation of [Bmim][N(CN)2] within the SEBS polymer matrix induced morphological variations with the presence of small voids within the polymer matrix. No significant physical-chemical changes occur upon the IL incorporation in the polymer, however an increase of the electrical conductivity from 1.44×10−14 Scm−1 to 2.94⊠10-11Scm-1 was observed. The piezoionic response was evaluated under loading and unloading compressive cycles with applied forces up to 5 N and 10 N, showing that independently of the applied force, the electrical resistance decreases with increasing pressure (Fig. 1a)). Additionally, a pressure sensitivity of approximately 25 kΩN−1 was observed, in a dynamic range from 0 to 10 N [2]
The suitability of the developed hybrid material as a transparent pressure sensor was evaluated through the development of a touch pad prototype compatible with printing technologies (Fig1b)).

References
[1] D.M. Correia et al., Advanced Functional Materials 30, 1909736 (2020).
[2] L.C. Fernandes et al., Composites Science and Technology 214, 108976 (2021).

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Session Classification: Quantum Materials and Quantum Technologies (Posters)

Track Classification: New principles and technologies for sensing