



P-5-214

## SYNTHESIS OF POLYURETHANE FERROELECTRET WITH NEW METHOD BASED ON POLYMERIC MEMBRANE FORMATION

Zahra khubi-arani, Seyed Reza Ghaffarian

*Department of Polymer Engineering, Amirkabir University of Technology, Tehran 15875-4413, Iran*

*\*Corresponding author: [zkhubi@aut.ac.ir](mailto:zkhubi@aut.ac.ir)*

Ferroelectrets are a new class of piezoelectric polymers. They consist of non-polar space-charge electrets with cellular foam structures. In these materials, charge separation effectively creates upper and lower void surfaces that are oppositely charged.

Dielectric elastomers are a class of electronic Electro-active polymers which can show high electromechanical responses to electric field. This actuator is made of an incompressible and highly deformable dielectric medium. When an electric field is applied across the parallel plates of a capacitor, the Maxwell stress causes the electrodes to get closer.

The charges generated in cellular structure can be caused to get closer the film in Dielectric elastomer actuators more and more. Cellular morphology can be gained with membrane technology in addition to foam preparation methods.

In this study, we prepared UV-cured polyurethane membrane with appropriate mechanical properties as dielectric elastomer actuator. We used UV curing for achieve elastic PU. This PU was synthesized using polytetramethylene glycol (PTMG) with  $M_w = 2000$  (as soft segment), isophorane diisocyanate (IPDI) and 1, 4 cis-2-Butene-1, 4-diol (as hard segment). After synthesis, polyurethane was dissolved in Dimethylformamide (DMF) or Tetrahydrofuran (THF) as solvent (30wt %). Then polymer solution was mixed with 1,6-Hexanediol diacrylate (HDDA) as diluent monomer (10wt%), Benzophenone (BF) as initiator (3 wt%) and N-Methyldiethanolamine as accelerator (3 wt%) in room temperature and polymer films with 200-300  $\mu\text{m}$  thickness was prepared by casting in to petridish. Then this mixture was precipitated in distilled water as coagulation bath in room temperature for cellular structure formation by wet casting method. The residual solvent was removed from the membrane by a series of washing steps. Finally, the formed membrane was dried in open air and exposed to UV irradiation (365 nm). Results of SEM and mechanical properties confirm that desired properties are gained.