

# Electrospun PVDF-TrFE Piezoelectric Nanofiber Membrane for Tissue Engineering Applications

Aochen Wang<sup>1</sup>, Ming Hu<sup>1</sup>, Xiaodi Zhang<sup>2</sup>, Jinxi Zhang<sup>2</sup> and Kailiang Ren<sup>2\*</sup>

<sup>1</sup>School of Electronic Information Engineering, Tianjin University  
No.92 Weijin Road, Nankai District, Tianjin, China,300192

<sup>2</sup>Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences  
No. 30 Xueyuan Road, Haidian District, Beijing, China, 100083

\*Ren Kailing: renkailiang@binn.cas.cn

In this investigation, PVDF-TrFE (poly(vinylidene fluoride-trifluoroethylene) polymer nanofibers were fabricated using electrospinning method for scaffold membrane applications. After the electrospinning, the PVDF-TrFE nanofibers were poled to show the piezoelectricity along  $d_{33}$  and  $d_{31}$  direction. Further, the electrospun PVDF-TrFE nanofibers were characterized by using XRD, FTIR and piezoelectric coefficient measurement. It is revealed that the parameters in the electrospinning process play a critical role on the crystallinity and piezoelectricity of the PVDF-TrFE nanofibers. From the XRD data, it is found that the annealing process can greatly enhance the crystallinity of the PVDF-TrFE nanofibers. Under an optimized electrospinning conditions, the remanent polarization ( $P_r$ ) and the piezoelectric coefficient  $d_{31}$  of electrospun P(VDF-TrFE) can achieve  $42.5 \text{ mC/m}^2$  and  $14.6 \text{ pC/N}$ , respectively. The mesenchymal stem cells (MSCs) and L929 fibroblast cells were seed on the membrane and their morphology was studied, respectively. From the experimental data, it is found that the MSC cells can grow orderly along the direction of the PVDF-TrFE fiber alignment. It also demonstrates that the poled PVDF-TrFE membranes significantly promote L929 fibroblast cells proliferation as compared with the unpoled nanofibers. Base on this property, the electrospun PVDF-TrFE nanofibers show a great promise for tissue engineering applications.