

**Abstract:** Laminated fluoroethylenepropylene (FEP) and porous polytetrafluoroethylene (PTFE) films with patterned void structure were successfully fabricated. An improved model taking into account of both the mechanical structure and charge distribution was used to describe the behavior of the fabricated films. The Young's modulus of the three-layer FEP/PTFE film is  $\sim 0.5$  MPa. Maximum quasi-static piezoelectric  $d_{33}$  coefficient up to 500 pC/N is achieved. Compared to the PP piezoelectrets, which lose their piezoelectric activity completely at the annealing temperature of 150 °C within 60 min, the laminated FEP/PTFE films show significantly improved thermal stability. For example, the  $d_{33}$ -coefficient retains  $\sim 22\%$  of the initial value for samples annealed at 150 °C for 4500 min.