Abstract： Fluorocarbon films with regular void structure, made of compact fluoroethylenepropylene (FEP), or skived polytetrafluoroethylene (PTFE), and patterned porous PTFE layers, are successfully fabricated by using a rigid template and fusion bonding process. A corona charging technique is used to make the films piezoelectric, i.e., to be piezoelectrets. The results show that the typical Young's moduli of the films are in the range of 0.45-0.80 MPa. A maximum quasistatic piezoelectric d_{33} coefficient up to 500 pC/N is achieved. Compared to the laminated FEP/porous PTFE piezoelectrets without regular void structure, the presently fabricated films show significantly improved thermal stability. Furthermore, when the films are designed, fabricated, and corona charged such that positive charges are deposited in the porous PTFE layers, the thermal stability of d_{33} coefficients can be further improved. For example, after annealing at 90 °C for 4500 min, these samples have a remaining d_{33} value of 86% compared with 77% for samples where positive charges are deposited in both, the porous PTFE and the compact FEP layers.