Abstract： Piezoelectrets, also known as ferroelectrets, are flexible space-charge electrets with piezoelectric effect. Piezoelectret has features such as strong piezoelectric d_{33} coefficient, flexibility, low dielectric constant, small acoustic impedance, and so on. In this article, the fabrication of the flexible film sensors based on polypropylene (PP) piezoelectrets is described first. And then the sensitivity, linearity and thermal stability of the flexible film sensors are investigated. The results show that the sensitivity of the fabricated sensors up to 200 pC/N is achieved. The sensitivity is constant in the range of the applied pressure from 0.06 to 15 kPa. After an aging at the temperature of 70°C for 100 h, the remaining sensitivity of the sensors is 50% of the initial value. The thermal stability of such flexible film sensors can be improved by a pre-aging treatment. The flexible film sensors fabricated in this study could be used in the intelligent transportation system, smart clothing and energy harvesting, etc.