Piezoelectrets are a relatively new group of piezoelectric materials consisting of cellular polymer films with lens-shaped air voids or of laminated polymer films with air cavities between the layers. After proper charging, these films possess a macroscopic polarization comprising charges of opposite polarity on opposing void surfaces. Such materials show piezoelectric $d_{33}$-coefficients more than ten times larger than those of the best non-cellular polymers and even higher than those of lead zirconate titanate (PZT). Other advantages of piezoelectrets are their flexibility and their low mechanical impedance. Studies over the last years were focused on the understanding of the physical properties of these materials and progress was made with respect to enhanced thermal stability of the piezoelectric activity, improved mechanical properties, and increased $d_{33}$-coefficients. Among the applications realized are microphones, ultrasonic transducers, accelerometers, pressure sensors, and energy harvesters. Recent studies of these materials and their applications will be discussed.