

## **Filters with <100 nm radius pores for gas separation formed by high-energy ion irradiation of polymers**

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In the industry, often gases have to be separated from each other for cleaning and other purposes. In principle, this can be achieved by passing a gas mixture through a filter system when the filter pore diameter is very small being comparable to the size of the mean free path of the gases. Such well-defined pores can be fabricated by high-energy ion irradiation of polymers, combined with chemical etching of the resulting damage in the polymer. Polyimide foil was irradiated with high-energy lead ions. The pores were evolved from the ion tracks by exposing the polymer to a chemical etching agent. The pore radius was determined by scanning electron microscopy (SEM). The shape of the pores through the foil was determined by filling them electrochemically with metal, cutting them into small pieces and investigating the edges again by SEM. The results showed that uniform cylindrical pores with radii below 100 nm could be formed. Using the gas mixture CO/CO<sub>2</sub> as a model system for the gas separation the filters were tested for their efficiency. The gas mixture was pumped through the filter and analysed by gas chromatography. The results show that a separation of the gas mixture is possible. Filters fabricated by ion irradiation may act as efficient gas separators.