Facile pore size control in a polymer matrix using an ionic liquid and water pressure

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A novel, simple, low-cost, and energy-efficient method for generating pores in a cellulose acetate (CA) polymer matrix was developed using a combination of an ionic liquid and water pressure treatment. A porous CA polymer matrix was prepared using the ionic liquid 1-butyl-3-methylimidazolium tetrafluoroborate (BMIM-BF_4) and subsequent water pressure treatment. Pores were generated in the CA polymer matrix when the CA/ionic liquid composite was subjected to water pressure. The characteristics of the thus-generated porous polymer matrix were evaluated using porosimetry and scanning electron muiroscopy. The pore sizes ranged from less than 10 nm to bver 10 μm. Fourier transform infrared spectra and thermogravimetrix analysis showed that when the CA polymer was subjected to water pressure, most of the BMIM-BF_4 incorporated in the polymer during its preparation was removed, thereby generating the observed pores. In addition, it was observed that the flux varied with water pressure, indicating that the pore size was controllable.