Photo-crosslinking of poly[ethene-stat-(methacrylic acid)]
functionalised with maleimide side groups

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Article first published online: 30 APR 2009
DOI: 10.1002/pi.2583

Abstract

BACKGROUND: Photo-crosslinkable polymers are well known and commercially applied as photoresists. But so far they have not been applied as membrane materials for separation processes. They would offer certain advantages in membrane fabrication over conventional crosslinked polymer materials. Therefore, in this work, a poly[ethene-stat-(methacrylic acid)] (PEMAA) which is a potential membrane polymer for different separation problems was functionalised with photo-crosslinkable maleimide side groups.

RESULTS: It has been shown that PEMA can be used as basic polymer material and a conversion with 3-hydroxypropylmaleimide is possible in order to obtain a photo-crosslinkable polymer. Investigation of the crosslinking mechanism was performed using stationary infrared and UV-visible spectroscopy as well as nanosecond transient spectroscopy absorption measurements of a rotating film. Intense transient absorption of the maleimide-esterified PEMA occurs at 250 nm in the film pointing to maleimide anion formation and crosslinking via an ionic dimerisation mechanism.

CONCLUSION: It is found that crosslinking reactions can be observed spectroscopically in situ using a maleimide-functionalised PEMA. Furthermore, experiments can be performed in the liquid phase (polymer in solution) as well as in the solid phase (polymer film) using a rotating polymer film sample. Maleimide anion formation and crosslinking via an ionic dimerisation mechanism can be investigated by variation of the polymer structure as well as the structure of the maleimide side groups.