

Application of ion beams to synthesis of environmentally responsive track membranes

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Heavy ion beams with energy in the order of 10 MeV/n were irradiated onto polyethylene terephthalate (PET) and polydiethyleneglycol-bis-allylcarbonate commercially known as CR-39 for producing organic porous membranes. The condition to obtain cylindrical pores was accounted for by the relation of restricted energy loss, REL, from ion beams to the polymer films with relative etching rate, Q , in the region along ion's trajectory versus non-irradiated region. Then the porous membranes were chemically modified by grafting such monomers as N-isopropylacrylamide and acryloyl-L-proline methyl ester onto the surface of pores to impart the characteristic of the hydrogel obtained from these polymers to the membrane.

The pore size of the membrane changed from an open state to a completely closed state when environmental conditions such as temperature were changed. The permeation of water, choline, insulin and albumin through the membrane was controlled by temperature. An abrupt change of permeability was observed at the phase transition temperature of the hydrogel.