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Preparation of Novel Microporous Membrane and Their Enhancement of Mechanical Properties Related with rystallinity

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Poly vinylidene fluoride(PVdF) is a polymer with increasing scientific attention and industrial importance because of its outstanding electrical properties. And also PVdF has been known as a very versatile polymer material because of its many applications, especially based on its ferro-, pyro-, piezoelectric properties.

The Poly vinylidene fluoride(PVdF) homopolymer was dissolved in DMF to form a 20 wt.% of polymer solution. The polymer solution in DMF were cast on a glass plate with doctor blade and immersed into the coagulation bath filled with non-solvent. Distilled water used as non-solvent A microporous membrane was prepared and it based on phase inversion of PVdF homopolymer via film casting from solution of the homopolymer in a mixture of solvent and non-solvent. The unique and unexpected pore morphology obtained by Scanning Electron Microphotographs and ionic conductivity was measured by Frequency Range Analysis. X-ray diffraction was used to identify crystalline phase of the prepared membrane. Membrane structure, especially pore size and its distribution, can be controlled for each specific application depending on the choice of the polymer, solvent, non-solvent. In this study, drying process at high temperature before immersed into the coagulation bath and uni-axial drawing process at room temperature werenewly adapted to enhance crystallinity, enhanced crystalline phase can enhance the mechanical property of the separator. The mechanical strength of the separator with a 200% draw ratio showed about 52 MPa, which is fourtimes higher than that of pure PVdF membrane. The ionic conductivity was also increased from 3.36×10^{-4} to 9.08×10^{-4} S/cm at 25℃.