

Poly(vinylidene fluoride-hexafluoropropylene)

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Thermal and Electrical Properties of Poly(vinylidene fluoride-hexafluoropropylene)-Based Proton Conducting Gel-Electrolytes

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가 가
poly(vinylidene fluoride - hexafluoropropylene) (PVdF - HFP)
, H₃PO₄ ethylene carbonate(EC) - butyrolactone(BL) dimethyl carbonate
(DMC) 30(PVdF - HFP) + 50EC/
DMC + 20H₃PO₄ 7.3 × 10⁻³ Scm⁻¹ 가
80

ABSTRACT : Polymer electrolyte films consisting of poly(vinylidene fluoride - hexafluoropropylene) (PVdF - HFP), H₃PO₄ and a mixture of ethylene carbonate(EC), - butyrolactone(BL) and dimethylcarbonate (DMC) were examined in order to obtain the best compromise between high protonic conductivity, homogeneity and dimensional stability. Measurements of differential scanning calorimetry and ionic conductivity have been carried out for various compositions. The highest proton conductivity of 7.3 × 10⁻³ Scm⁻¹ at 30 were obtained for a film of 30(PVdF - HFP) + 50EC/DMC + 20H₃PO₄. From the thermal study, it has been found that the PVdF - HFP gels are stable up to 80, and the H₃PO₄ enhances the miscibility of the polymer and the solvent by interacting sensitively with polymer segments.

Keywords : proton conductivity, proton conducting gel electrolyte, polymer electrolyte, PVdF-HFP.

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3-6

가^{1,2}
, polyelectrolyte
hydrogel poly(acrylonitrile) (PAN), poly
(methyl methacrylate) (PMMA) poly(vinyl-

dene fluoride) (PVdF)

Li - 가
 Li - H₃PO₄, H₂SO₄ -

propylene carbonate(PC)
 PC ethylene carbonate(EC)

PMMA³⁻⁶ PVdF poly
 (vinylidene fluoride - hexafluoropropylene) (PVdF - HFP)

PVdF

⁸ PVdF - HFP EC
 - butyrolactone(BL) EC dimethyl
 carbonate(DMC) H₃PO₄

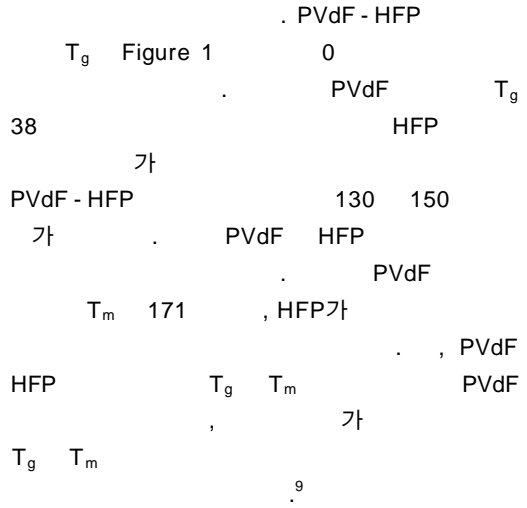
PVdF - HFP (92 wt% PVdF 8 wt% HFP
 (Solvey)), H₃PO₄ (99.999%
 , Aldrich), EC, BL DMC , tetrahyd-
 rofuran (THF)

4 - (molecular sieve)
 . 1:1 EC/BL EC/DMC
 H₃PO₄ THF
 60 PVdF - HFP

Ar THF
 가 25 100 μm free - standing
 . PVdF - HFP 30 mol%

HFP
 Shimadzu differential scanning
 calorimeter (TA - 50 WSI)
 10 mg He
 - 130
 - 110 250 10 min⁻¹ 가
 (HP model 4192A
 LF)
 100 Hz 1 MHz
 Z Z
 Z

Figure 1 PVdF - HFP EC, BL
 EC/BL DSC



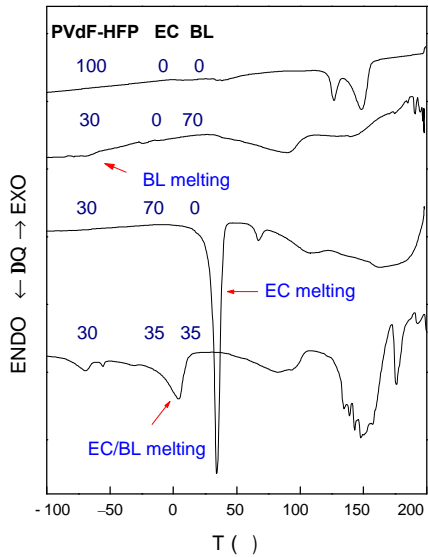


Figure 1. DSC thermograms of PVdF - HFP polymer and PVdF - HFP + EC/BL gels.

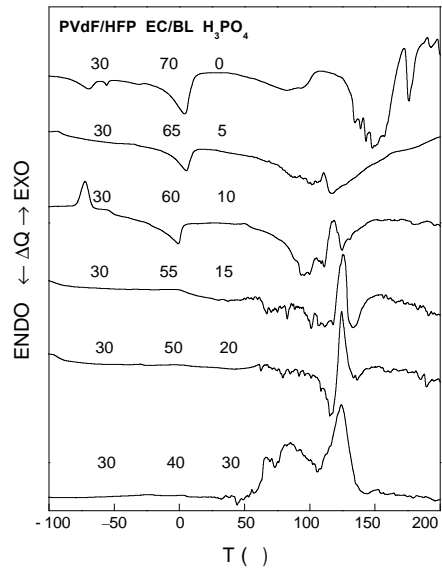


Figure 2. DSC thermograms of PVdF - HFP + EC/BL + H₃PO₄ proton conducting gel electrolytes.

T _g	가	30PVdF - HFP + 70BL
	BL	-61
	EC	
34		30PVdF - HFP + 35BL + 35EC
EC/BL	4	BL EC
	-43 39.5	가
	BL	가 EC
		BL PVdF - HFP

Figure 2 3
EC/BL + H₃PO₄
+ H₃PO₄ DSC

T _g	가	PVdF - HFP + EC/DMC + H ₃ PO ₄
		20
		PVdF - HFP
		가
		EC/BL 가
		EC/DMC가

EC/BL 가

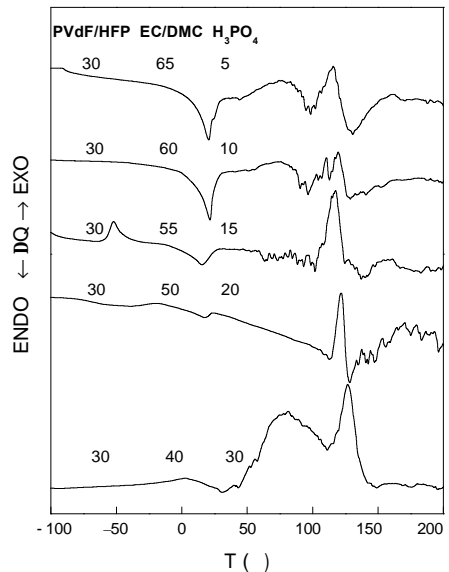


Figure 3. DSC thermograms of PVdF - HFP + EC/DMC + H₃PO₄ proton conducting gel electrolytes.

5. S. Panero and B. Scrosati, *J. Power Sources*, 90, 13(2000).
6. W. Wieczorek, G. Zukowska, R. Borkowska, S. H. Chung, and S. Greenbaum, *Electrochim. Acta*, 46, 1427(2001).
7. F. Gray and M. Armand, in "Handbook of Battery Materials", ed. by J.O. Besenhard, part , ch. 8, Wiley - VCH, 1999 and references therein.
8. A. S. Gozdz, J. M. Tarascon. O. S. Gebizlioglu, C. N. Schmutz, P.C. Warren, and F. K. Shokoohi, in "Rechargeable Li and Li - ion Batteries", eds. by S. Megahed, B. M. Barnett and L. Xie, Electrochem. Soc., Pennington, 1995.
9. R. G. Beeman, *J. Polym. Sci.*, 9, 472(1953).
10. Y. W. Kim, M. S. Gong, and B. K. Choi, *J. Power Sources*, 97 - 98, 654(2001)
11. K. Hayamizu, Y. Aihara, S. Arai, and W. Price, *Solid State Ionics*, 107, 1(1998).
12. S. Abbrent, J. Plestil, D. Hlavata, J. Lindgren, J. Tegenfeldt, and Å. Wendsjö, *Polymer*, 42, 1407 (2001).