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APPENDICES

Appendix A Raw Material Datasheets

Datasheet of PVDF-HFP Solef® 1010/1001 from Prostar Chemicals Co., Ltd.

Table A1 Some properties of Solef 1010/1001 PVDF-HFP copolymer

Properties	Values	Standard
Appearance	White powder	Visual inspection
Melt Flow Index (MFI) at 230°C (5 kg)	7 g/10 min	ASTM D 1238
Volatile Content	0.05 %	SOLVAY method
Density	1.76-1.80 g/cm2	ASTM D 792
Tensile stress at break	≥20 MPa	ASTM D 638 D
Elongation at break	350 %	ASTM D 638 D
Tensile Modulus	≤1200 MPa	ASTM D 638 D
Melting Point	158-162 °C	ASTM D 3418
Vicat Point 1	≥145	ASTM D 1525
Vicat Point 5	≥90	ASTM D 1525
Brittleness Temperature	≤-14	ASTM D 746

Appendix B Dynamic Mechanical Properties of Neat PVDF-HFP

Furthermore, the variation of the storage modulus and damping factor with temperature was studied via DMA technique in the tensile mode, and the results are shown in Figure B1. PVDF-HFP had a high tensile modulus in the -70-0°C temperature range. The tensile modulus decreased gradually with increasing temperature because of the heating effect. This was due to the melting of the short polymer side chains of the host polymer (Jiang, Z., 1997).

There were 3 relaxation regions obtained from damping factor graph, which referred to β, β' and α relaxation state. The first relaxation was called β-relaxation shows the dynamic glass transition temperature (T_g) of material which was found at -39.9 °C. This relaxation refers to the molecular movement in amorphous regions which referred to the dramatically decreasing of the PVDF-HFP films. The second relaxation was found in the temperature range from 0 °C to 50 °C which was referred to β' relaxation. Patro.,2008 explained that this relaxation indicated to the folded of amorphous regions due to the compressed-force. The last relaxation called α relaxation that associated with segmental motion in the crystalline regions, exhibited near the melting temperature of PVDF-HFP.

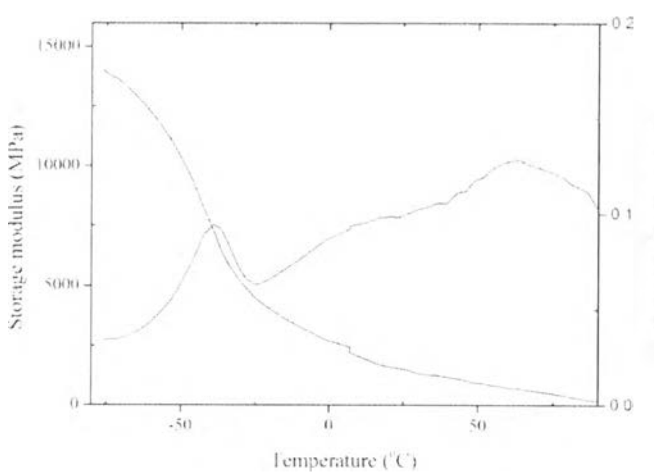

Figure B1 The storage modulus (E) and damping factor of PVDF-HFP film in the -70–100°C temperature range.

CURRICULUM VITAE

Name: Ms. Paranya Chanajaree

Date of Birth: February 27, 1990

Nationality: Thai

University Education:

2008–2012 Bachelor Degree of Science (Chemistry), Faculty of Science, Chulalongkorn University, Bangkok, Thailand

Work Experience:

2012-2013 Position: Technical Service and Marketing

Company name: Thai Parkerizing Co., Ltd. Rayong, Thailand

Proceeding:

1. Chanajaree, P.; and Manuspiya, M. (2015, April 23) Dielectric and Piezoelectric Behaviors of Cellulose/ PVDF Composite Film Prepared By Melt Mixing Method. Proceeding of the 6th Research Symposium on Petroleum, Petrochemicals, and Advanced Materials and the 21th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

Presentations:

1. Chanajaree, P.; and Manuspiya, M. (2015, April 23) Dielectric and Piezoelectric Behaviors of Cellulose/ PVDF Composite Film Prepared By Melt Mixing Method. Paper presented at the 6th Research Symposium on Petroleum, Petrochemicals, and Advanced Materials and the 21th PPC Symposium on Petroleum, Petrochemicals, and Polymers. Bangkok, Thailand.
2. Chanajaree, P.; and Manuspiya, M. (2015, June 24-25) Preparation and characterization of PVDF-microcrystalline cellulose nanocomposite by melt process. Paper presented at the European Polymer Congress 2015. Dresden, Germany.