STUDY ON OPTIMAL SYNTHESIS AND PROPERTIES OF HIGH PERFORMANCE POLYURETHANE ELASTOMERS USING RESPONSE SURFACE METHODOLOGY

張德展、

E-mail: 9015678@mail.dyu.edu.tw

ABSTRACT

THE FORMULATION AND OPTIMIZATION OF THERMOPLASTIC POLYURETHANE ELASTOMERS (TPU) PHYSICAL PROPERTIES WERE EVALUATED BY MIXTURE RESPONSE SURFACE METHODOLOGY IN THIS STUDY. THE MOLAR RATIO OF MAIN REACTION WAS 1：2：3 (POLYESTER POLYOL：CHAIN EXTENDER ：DIPHENYLMETHANE-4,4'-DIISOCYANATE). TPUS PREPARAED FROM DIFFERENT CHAIN EXTENDERS BLENDS OF BISPHENOL A ETHOXYLATE (BPE-20F), DIMER DIOL AND 1,4-BUTANEDIOL (1,4BD) WERE CHARACTERIZED BY DSC, TGA AND DENSITY MEASUREMENT. BY DSC THERMOGRAMS WITH NO SIGNIFICANT MELTING POINT, TPUS WERE RANDOM COPOLYMER. TGA DATA SHOWED THAT THE THERMAL DEGRADATION TEMPERATURES OF THE POLYMERS INCREASED AS THE CONTENTS OF DIMER DIOL INCREASED. THE DENSITIES OF THE POLYMERS INCREASED AS THE CONTENT OF BPE-20F INCREASED.

Keywords : MIXTURE RESPONSE SURFACE METHODOLOGY, THERMOPLASTIC POLYURETHANE ELASTOMERS, POLYESTER POLYOL, DIPHENYL- METHANE-4,4'-DIISOCYANATE, CHAIN EXTENDE

Table of Contents

REFERENCES

1.石化工業(1998a)，19 (11)，頁9。 2.石化工業(1998b)，20 (3)，頁13。 3.張詔斌 (1999) ，熔融級熱可塑性聚胺酯彈性體合成與特性探討，大葉大學食品工程研究所碩士論文 。 4.陳世春(1997)塑膠物料入門-成型加工技術參考，復漢出版社，台南市。 5.陳瑞祥 (1998)高分子材料於生物醫學領域之應用及發展，工研院化工所。 6.傅明源(1996)聚胺酯彈性體及其應用，中國石化出版，北京。 7.開發登(1990)，合成樹脂，36 (7)，頁29。 8.經濟部技術處，中國紡織工業研究中心，尖端科技纖維產品研討會，經濟部科技研究發展專案計劃 - 紡紗技術開發五年計劃(三)。 9.賴耿陽(1997)聚?酯樹酯PU原理與實用，復漢書出版社，台南市。 10.謝立生(1997a)熱可塑性彈性體技術手冊，高分子工業雜誌社，台北市。 11.謝國煌，韓錦鈴(1997b)熱塑性聚胺酯材料之特性與應用，塑膠資訊，14。 12.謝永堂，廖勇迪，林忠平(1997c)彈性纖維用熱塑性PU彈性體之合成與性質分析，國立雲林技術學院 化學工程技術系。 13.謝永堂，廖勇迪，涂耀國(1998)熱塑性PU彈性體之合成與性質分析，科技學刊，7(2)，頁177-122。 14.Ahn, T. O., S. U. Jung, H. M. Jeong and S. W. Lee (1993) The properties of polyurethane with mixed chain extenders and mixed soft segments. 15.Cornell, J. A. (1983) How to run mixture experiments for product quality, American Soc -iety for Quality Control , Milwaukee, WI. 16.Heimhard, K. (1993) Plastvearbtter, 44 (4), 37. 17.Maurice, M. (1987) Van Nostrand Reinhold, Rubber Technology. 3rd ed, 439-481, New York. 18.McComb, M. E., R. E. Oleschuk, D. M. Manley, L. Donald, A. Chow, J. D. O'Neil, W. Ens, K. G. Standing and H. Perreault (1997) Use of a non-polyurethane membrane as a sample support for matrix-assisted laser desorption/ionization time-of-flight mass spectrometry of peptides and proteins, Rapid Commum Mass Spectrom, 11(15), 1716-1722. 19.Oertel, G. (1985) Polyurethane Handbook, Hauser Publisher, NEW YORK. 20.Ott, L. (1988) An Introduction to Statistical Methods and Data Analysis, 3rd ed., PWS-Kent Publishing Co., Boston. 21.Perry, R. H. and C. H. Chilton (1973) Chemical Engineer's Handbook, 5thed, McGraw-Hill, NEW YORK. 22.Pompe, G., A. Pohlers, P. Potschke and J. Pionteck (1998) Influence of processing condi -tions on the multiphase of segmented polyurethane, Polymer, 39(21),5147-5153. 23.SAS (1990) SAS User's Guide. SAS Institute, Inc., Cary, Nc. 24.Sayigh, A. A. R., H. Ulrich and W. J. Farrissey (1972) Condensation Monomers, chap. 5, J. K. Stille, ed, John Wiley, NEW YORK. 25.Scheffa, H. (1958) Experiments with mixtures.

J. Royal. Stat. Soc. B, 20, 344-360. 26.Shieh, Y. T., H. T. Chen, K. H. LIU and Y. K. TWU (1999) Thermal Degradation of MDI -Based Segmented Polyurethane. Journal of Polymer Science: Part A: Polymer Chemistry, 37, 4126-4134 . 27.Shintani, H.(1995) Formation and elution of toxic compounds from sterilized medical products:methylenedianiline formation in polyurethane, J. Biomater. Appl., 10(1), 23-58 28.Shook, D. R., J. L. Doppman, E. L. Cattau and S. R. Goldstein (1986) Everything Cathe -ter for broad clinical application, J. Biomech. Eng, 108(2), 168-174. 29.Siefken, W. (1948) Annal Chem, 562, 75 30.Suhara, F., S. K. N. Kutty and G. B. Nando (1998) Thermal degration of short polyester fiber-polyurethane elastomer composite, Polymer Degradation and stability, 61, 9-13. 31.United States Patent 5470935 (Bayer Corporation). 32.Vogl, O. (1991) Progress in Polymer Science, Polyurethane Elastomers. 33.Zdrahala, R. J., D. E. Spielvogel and M. A. Strand (1988) Softening of thermoplastic polyurethane:a structure / property study, J. Biomater. Appl., 2(40), 544-561.