Fabrication and characterization of a new piezoelectric polymer film

何旻衡、林見昌

E-mail: 9707927@mail.dyu.edu.tw

ABSTRACT

Because of the piezoelectric effect between the electric and mechanical coupling the piezoelectric materials, have been used extensively in recent years. Modern engineering and scientific materials have developed from early structural materials to the modern multi-functional materials. The piezoelectric material have the functions such as investigation, sensing and actuating, and have been applied to the engineering of microelectromechanical system. Compared with the early piezoelectric materials, the polymer materials have many advantages, such as easy to manufacture, low cost and flexible. So the polymers have been developed as the major new-type piezoelectric materials in recent years. In this paper, we use Cyclic Olefin Copolymer material to make a thin electrode layer of COC. Then the COC layer is poling by high voltage field and it ’ s piezoelectric properties are measured. Discussions are made to the obtained results.

Keywords : COC ; electrets ; electrets polymer

Table of Contents

REFERENCES

[1] J. Curie and P. Curie, Bull. de la Soci'et'e Mineralogigue de France,3(1880)90.
[2] J. B. Lando, H. G. Olf, and A. Peterlin, J. Polym. Sci. A-1, 4 (1996)941.
[3] R. J. Phelan, Jr., R. L. Peterson, C. A. Hamilton, and G.. W. Day,Ferroelectrics, 7(1974)375.
[4] J. Cohen and S. Edelman, J. Appl. Phys., 42 (1971) 3072.
[5] E. Fukada and K. Nishiyama, Jpn. J. Appl. Phys., 11 (1972) 36.
[6] N. Murayama, T. Oikawa, T. Katto, and K. Nakamura, J. Polym. Sci., Phys. Ed.,13 (1975)1033.
[7] S. Edelman, L. R. Grisham, S. C. Roth, and J. Cohen, J. Acoust. Soc. Amer., 48 (1970)1040.
[8] J. Cohen and S. Edelman, J. Appl. Phys., 42 (1971)893.
[9] H. Kawai, Jpn. J. Appl. Phys., 8 (1969) 975.
[10] H. Kawai,.Ohyobutsuri, 38 (1969) 1133; 39 (1970) 413; 39 (1970) 369.
[11] E. Fukada, M. Date, and K. Hara, Jpn. J. Appl. Phys., 8 (1969) 151.
[12] E. Fukada and L. Yasuda, Jpn. J. Appl. Phys., 3 (1964) 117.
[13] M. Date, S. Takashita, and E. Fukada, J. Polym. Sci., Part A-2, 8 (1970) 61.
[14] T. Furukawa and E. Fukada, Nature, 221 (1969) 1235.
[15] H. Ohigashi, J. Appl. Phys., 47 (1976) 949.
[16] Tiersten HF (1969), ” Linear piezoelectric plate vibrations. ” Plenum press,New York.Sunar M (1996), ” Discrete and distributed sensor and actuator design for intelligent [17] P. Tan, L. Tong, D. Sun, “ Dynamic characteristics of a beamsystem with active piezoelectric fiber reinforced composite layers, ” School of Aerospace, Mechanical and MechatronicEngineering, 2 January 2002 , Composites [18] Isaku Kannoa, Hidetoshi Kotera, Kiyotaka Wasa, “ Measurement of transverse piezoelectric properties of PZT thin films. ” Sensors and Actuators, May 2003, p.p.68-74 [19] V.V. Spirina, I.A. Sokolov, Kwangsoo No, “ Determination of piezoelectric coeffcients of ferroelectric thin films using GaAs:Cr adaptive interferometer. ” Optics & Laser Technology, Oct 2003, P.P.337-340 [20] Xuejun Zheng, Jiangyu Li, Yichun Zhou, “ X-ray diffraction measurement of residual stress in PZT thin films prepared by pulsed laser deposition. ” Acta Materialia, Aprl 2004, P.P.3313-3322 [21] Lulu Zhang, Masaaki Ichiki, Ryutaro Maeda, “ Residual stresses in Pt bottom electrodes for sol-gel derived lead zirconate titanate thin films. ” Journal

of the European Ceramic Society, 2004, p.p1673-1676 [22]“ 陶瓷技術手冊 ”，經濟部技術處發行，中華民國產業科技發展協進會與中華民國粉末冶金協會出版(1994/07) [23] 周忠誠，“ 壓電元件與複合壓電結構之動態特性分析與量測 ”，台灣大學機械工程研究所博論文，台北(1998/06)