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Communications to the Editor

Comment on a Paper by Hurung-Rern Lee, Tsai-An Yu, and Yu-Der Lee

The recently published paper "Characterization and Dissolution Studies of a Benzophenone-Containing Organic-Soluble Polyimide", by H. R. Lee et al. (*Macromolecules* **1990**, *23* (2), 502), contains numerous paragraphs and a mathematical model previously published in our contribution (Parsonage et al. "Properties of positive resists. II. Dissolution characteristics of irradiated poly(methyl methacrylate) and poly(methyl methacrylate-*co*-maleic anhydride)", *J. Vac. Sci. Technol.* **1987**, *B5*, 538). Their mathematical model uses virtually the same definitions, the same words, the same equations, and the same parameter evaluation as our previous work—albeit with an error in one of the boundary conditions—without any statement acknowledging that their model is in fact our 1987 model.

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Liquid-Crystalline Polymer Gels. 2. Anisotropic Swelling of Poly(γ-benzyl L-glutamate) Gel Cross-Linked under a Magnetic Field

Polymer gels are usually isotropic and swell and shrink equally in all directions.[1-6] If gels of anisotropic molecular structure were prepared, anisotropic mechanical behavior will be expected.

Liquid crystals are typical anisotropic materials in which molecules are arranged along a specific direction. Polymer gels with liquid-crystalline order have been prepared by cross-linking lyotropic cholesteric liquid crystals (CLC) of poly(γ-benzyl L-glutamate) (PBLG) with several diamino compounds as cross-linkers.[7] The gel retained original CLC order when the PBLG molecules take helix conformation, but it became isotropic when it was immersed in a random-coil solvent. The CLC–isotropic change was reversible and could be repeated many times.[7]

However, since the PBLG CLC gels had a multidomain structure (texture), the CLC–isotropic change induced a volume change with a very small anisotropy. In this study, a concentrated solution of PBLG in dioxane (DOX) was cross-linked under a magnetic field to prepare polymer gels with a nematic liquid-crystalline (NLC) order. In the NLC state the polypeptide helices are known to be oriented along the magnetic field.[8-10] The NLC gel showed an anisotropic volume change when the solvent was changed from a helix-supporting one to a random-coil one. Preparation of PBLG films oriented under a magnetic field has been reported.[10] The non-cross-linked *film* showed an anisotropic swelling in benzene. The anisotropic change of cross-linked PBLG *gels* that are oriented under a magnetic field is first reported in this paper.

PBLG (a gift from Ajinomoto Co., Ltd., M_w = 170 000) was dissolved in DOX (17–25 wt %) containing triethylenetetramine (TETA) or diethylene glycol bis(3-aminopropyl) ether (DGBA) as a cross-linker. The concentration of the cross-linker was 10 mol % with respect to the monomer unit of PBLG. The solution was placed in a glass tube of 2–5-mm diameter. The tube was allowed to stand under a magnetic field (21 kG) at 25 °C. The magnetic field was applied perpendicular to the glass tube. After the orientation of PBLG was equilibrated (24 h), the mixture was heated to 55–70 °C and maintained at this temperature for 7–10 days under the magnetic field. Under this condition, the helix axis of the polypeptide chain has been reported to orient along the magnetic field.[8-10] The cylindrical gels prepared were sliced into disks in which PBLG helices are aligned along the disk surface and oriented to the direction of the magnetic field. Macroscopic dimensions of the gel were measured for the disk-like gel (2–5-mm diameter).

The texture of the gel was observed for a sample prepared in a flat cell with a thickness of 0.2 mm under the magnetic field applied perpendicular to the cell. An optical microscope equipped with a cross-polarizer was used for the observation of the texture.

Microscopic pictures of the LC gels prepared from a mixture of PBLG (20 wt %) in DOX containing TETA were taken under crossed polarizer. The gel prepared

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