15A, 2003G050

Anisotropic Structure and Its Structrual Relaxation of dehydrated N-isopropylacrylamide/sodium acrylate Copolymer Gel

Masaaki SUGIYAMA*[1], Masahiko ANNAKA[2], Toshiharu FUKUNAGA[1], Keiji ITOH[1], Kazuhiro MORI[1], Kazuhiro HARA[3]

[1]Research Reactor Institute, Kyoto Univ., Kumatori, Osaka 590-0494, Japan

[2] Dep. of Chem., Kyushu Univ., Hakozaki, Fukuoka 812-8581, Japan

[3] Institute of Environmental Systems, Kyushu Univ., Hakozaki, Fukuoka 812-8581, Japan

Introduction

It is important to control a structure to create a new functional material, especially in nano-scale. If the specific structure is attained as an thermo-equilibrium state, it could promise us the easy way to obtain the material with the specific feature. In a present study, we create a gel with an anisoropic structure in the thermo-equilibrium state, and show its structural relaxation to an isotropic one under the higher temperature.

We adopted an *N*-isopropylacrylamide / sodium acrylate (NIPA/SA) gel as a starting material, which shows a microphase separation in the dehydration. Aiming to create the material which has an anisotopic structure in nano scale, we prepared the stretched and dehydrated NIPA/SA gel and observed its mesoscopic structure with a small-angel x-ray scattering (SAXS) method. To observe an anisotpic structure in the stretched and dehydrated NIPA/SA gel, a SAXS camera with a two-dimensoinal detector is very suitable. Therefore, we conducted the SAXS apparatus installed at BL15A.

Experimental

Firstly, we prepared the dehydrated NIPA/SA gel of which the ratio of [NIPA] to [SA] is 400 to 300. Secondly, we added the water to the dehydrated NIPA/SA gel. Thirdly, the gel which regained elasticity was stretched in one direction. Finally, the stretched gel was dried in an atopmspher again.

The SAXS experiments were carried out with a SAXS apparatus installed at BL15A of Photon Factory in Institute of Materials Structure Science (IMSS), High Energy Accelerator Research Organization (KEK), Tsukuba, Japan. A 2-dimensional intensity distribution of the scattered X-ray was measured by an image-intensifier and X-ray CCD camera system (C7300, HAMATSU Photonics K.K.).

Results and discussion

Figure 1 shows 2-dimensional SAXS profiles of a stretched and dehydrated NIPA/SA gel. As you can see, the gel has an anisotropic structure in nano-scale. Figure 2 shows temperature dependences of equatorial and meridional scatterings. It is deduced that over 50C the polymer chain could begin to move and the anisotropic structure could change to an isotropic one.

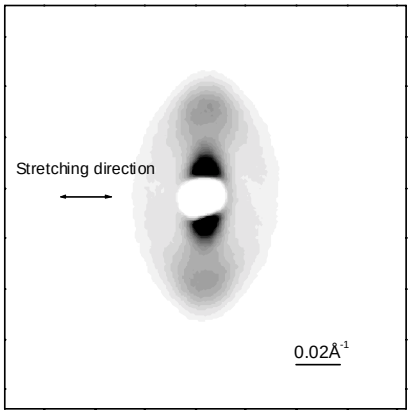

Figure1. 2-dimensional SAXS pattern of a stretched and dehydrated NIPA/SA gel.

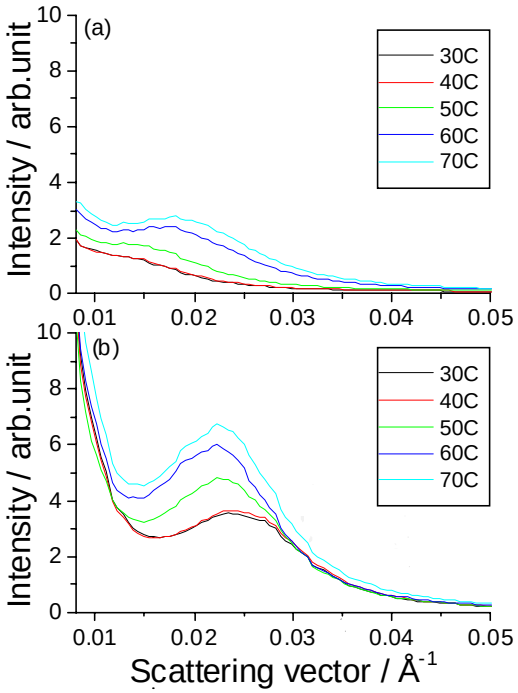

Figure 2. Temperature dependences of (a) equatorial and (b) meridional scattering intensities.

*sugiyama@rri.kyoto-u.ac.jp