Dynamic Viscoelasticity of Liquid Crystal Elastomer Films Containing Dual Frequency Liquid Crystalline Groups

Kazuma Nagata,[a] Takayuki Menjo,[a] Kosuke Kaneko,[a] Daiki Fujioka,[a] Kiyomi Fuchigami,[b] Kimiyoshi Kaneko,[c] and Tomonori Hanasaki[a]

[a]*Department of Applied Chemistry, College of Life Sciences, Ritsumeikan University.*

*E-mail:*hanasaki@sk.ritsumei.ac.jp

[b]*R&D., Shofu Inc.*

[c]*Research Organization of Science and Technology, Ritsumeikan University.*

Liquid Crystal Elastomers (LCEs) are responsive to external stimuli such as heat and light. There are few reports on change in viscoelasticity due to the phase transition of the LCEs, and only the small amount of the change has been observed. In addition, the practical application using the LCEs is still difficult because the thermal stimulation is used to cause the phase transition with shape change.[1] In this study, we developed the dual frequency LCE film in which the orientation of LC molecules is controlled by the frequency of the applied AC electric field to provide a switching function of an increase or decrease in viscoelasticity. (Fig. 1)

The desired LCE film was obtained by the procedure shown in Fig. 2.

Fig. 3 shows the dynamic viscoelastic behavior of the LCE films when an electric field was applied. The measurement was performed in the following condition:

-20 ºC, strain 2 %, strain frequency 1 Hz, and voltage 6 kV / mm.

It was found that the storage modulus of the LCE film can be changed by the application of an electric field. The details of the mechanism of the viscoelasticity change will be discussed in the poster session.

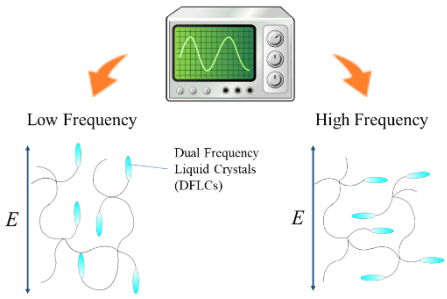

Fig. 1 Orientation change of DFLCs inside the liquid crystal elastomer film due to different frequency of applied AC electric field.

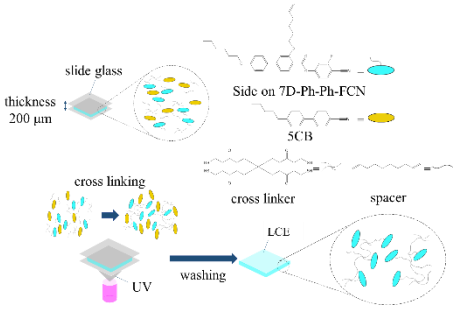

Fig. 2 Preparation of the LCE film.

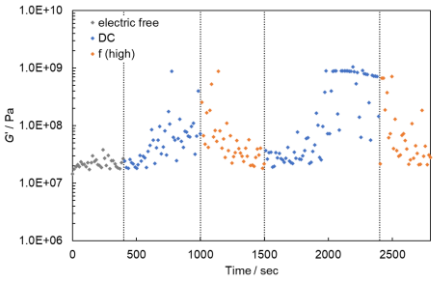

Fig. 3 Dynamic viscoelasticity of the LCE film.

[References]

1) D. Rogez, S. Krause, and P. Martinoty, *Soft Matter*, **2018**, *14*, 6449-6462.