

Liquid Crystalline Nanosheets/Polymer Composite Gels with Structural Colors

(Graduate School of Engineering, Fukuoka Institute of Technology) ○ Nobuyoshi Miyamoto

Keywords: *Structural Colors; Inorganic Nanosheets; Liquid Crystals; Nanocomposite Gels*

Inorganic nanosheets obtained by exfoliation of layered crystals have been investigated as intriguing nanomaterials for various functional materials. Under a certain condition, nanosheets dispersed in a solvent are spontaneously ordered to form crystal phase with regulated superstructures¹. In this study, we prepared the layered perovskite nanosheet liquid crystals with lamellar-like periodic structure that show structural colors and immobilized them in polymer gel by in-situ polymerization technique,² in view of applications as stimuli-responsive soft materials.

The perovskite nanosheets colloids were synthesized using the method reported previously.¹ To obtain the composite gels, monomers (e.g., *N*-isopropylacrylamide), crosslinker and photoinitiator were dissolved into the nanosheet colloid and the mixture was irradiated with UV-light to proceed photo polymerization.

The nanosheet colloid (3 wt%) showed pearl-like structural color, giving the maximum reflectance wavelength (λ_{max}) of 450 nm in the visible reflectance spectrum. As the monomer was added, λ_{max} shifted to 439 nm, indicating the slight change of the interactions between nanosheets. Even after polymerization and swelling to equilibrium state, the structural color was retained ($\lambda_{\text{max}} = 567$ nm), indicating successful immobilization of the superstructure of the liquid crystalline nanosheets. The color of the gel was reversibly changed by mechanically compressing the gel.

Acknowledgment: This research was supported by KAKENHI (#24104005 and #15K05657) and Network Joint Research Center for Materials and Devices (#20191350).

References

- [1] N. Miyamoto, S. Yamamoto, K. Shimasaki, K. Harada, Y. Yamauchi, *Chem.Asian J.* **2011**, 6, 2936
- [2] W. Yang, S. Yamamoto, K. Sueyoshi, T. Inadomi, R. Kato, N. Miyamoto, *Angew. Chem. Int. Ed.* **2021**, 60, 8466.