

Transparent and stretchable films prepared by directional freezing method

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Stretchable films of elastomers have been used in research for the development of display devices or flexible composite materials that can be attached to the skin. However, the use of elastomer is limited due to high moisture permeability and positive Poisson's ratio. In this study, directional freezing technique was used for making align structures which can implement the auxetic characteristics. For align structures, cellulose nanocrystal (CNC) and poly(dimethylsiloxane) (PDMS) were used. CNC was prepared from Avicel using tetrabutylphosphonium hydroxide (TBPH), and tert-butyl alcohol (TBA) was used as a solvent. It is mixed with PDMS to align the CNC by the directional freezing. Transparency was secured through the combination of CNC and PDMS into composite films. To confirm the alignment of the composite structure, birefringence was observed using the crossed polarizers of an optical microscope. Barrier properties can further be added through the alignment of CNC and the surface modification of the PDMS.