Meetings International

Polym Sci 2017, 3:4
DOI: 10.4172/2471-9935-C1-006

ANNUAL MEETING ON
BIOPOLYMERS AND DRUG DELIVERY SYSTEMS
OCTOBER 12-13, 2017 OSAKA, JAPAN

Tunable angle dependent/independent structural color of hydrogel by modulating lamellar structure

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In this paper, we report tunable angle dependence of stimuli responsive photonic hydrogels containing multi-lamellar structure of alternative rigid polymeric platelets of high refractive index and ductile polymer matrix of low refractive index. Therefore, the refractive index variation and periodic lamellar spacing satisfies the Bragg's law to diffract visible light and the gel exhibits magnificent structural color. The packing geometry of periodic multi-lamellae of the photonic crystal is fabricated from flat-lamellae to cylindrical lamellae. 1D photonic crystalline lamellar sheet domains forms a rectangular sheet hydrogel in which the lamellar sheets aligned periodically parallel to the top surface. On the other hand, cylindrical rod-like colored gel is achieved by arranging periodic multi-cylinder packing of the lamellar domains. The cylindrical photonic hydrogel exhibits angle independent color whereas the sheet hydrogel reveals strong angle dependency. A rocking curve has been constructed to justify the tunable angle dependency of the multi-lamellar hydrogel. The tunable angle dependency of this photonic material could potentially benefits light modulation, visualization, optical sensing and display technologies.

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