

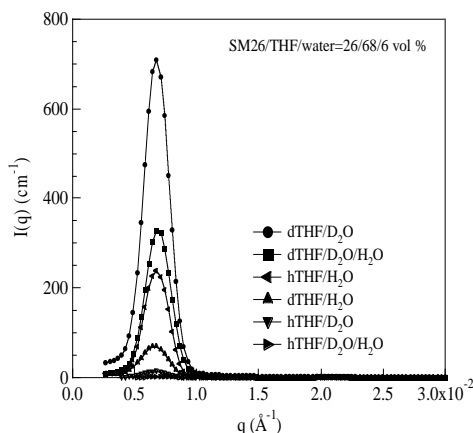
# ENHANCEMENT OF REFRACTIVE INDEX CONTRAST IN BLOCK COPOLYMER SOLUTIONS USING SELECTIVE SOLVENT MIXTURES FOR PHOTONIC CRYSTALS

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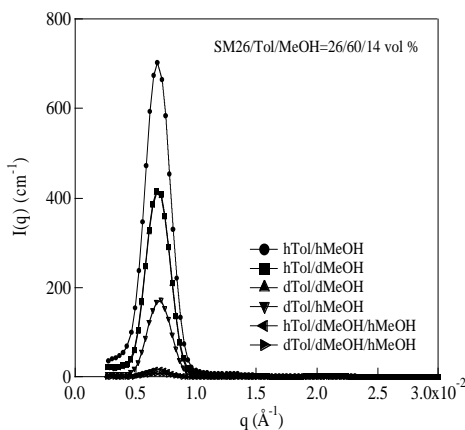
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## ABSTRACT

In block copolymer solutions, rich lyotropic and thermotropic order-order and order-disorder transitions are accessible. We found that microphase separation is induced when an AB-type diblock copolymer is dissolved in mixture of a good and a non solvents in which one block is slightly soluble and the other is insoluble. Diblock copolymer utilized was poly(styrene)-*block*-poly(methyl methacrylate) (PS-*b*-PMMA) with a molecular weight of  $2.1 \times 10^5$  and the PS volume fraction of 0.64. We used two kinds of solvent mixtures, i.e., (i) tetrahydrofuran (THF) / water and (ii) toluene (Tol) / methanol (MeOH) as good and non solvents, respectively. Small angle neutron scattering measurements were conducted at 40m SANS Beamline in HANARO, Korea to evaluate the spatial distribution of the solvent molecules at the constant BCP concentration of 26 vol.% by the contrast variation method using the mixtures of protonated and deuterated solvents[1]. Figs. 1 and 2 show 1d profiles of the block copolymer solutions described above. By changing the ratios of protonated and deuterated solvents, the scattering length densities of the solutions were varied. The intensity change of the primary peak revealed the spatial distributions of the solvents. The THF and water mixture was mainly sequestered into the PMMA phase and behaved as a single solvent. In contrast, Tol and MeOH were separately distributed into the PS and PMMA phases, respectively. This separately sequestering behavior of different solvents leads to enhancement of refractive-index contrast between constituent phases in solutions for promising photonic materials.



**Fig.1** 1d-profile of block copolymer solution dissolved in THF and water



**Fig.2** 1d-profile of block copolymer solution dissolved in Tol and MeOH

## Acknowledgement

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## References

<sup>1</sup> Ching-i Huang et al., *Macromolecules* **1998**, *31*, 9384-9386