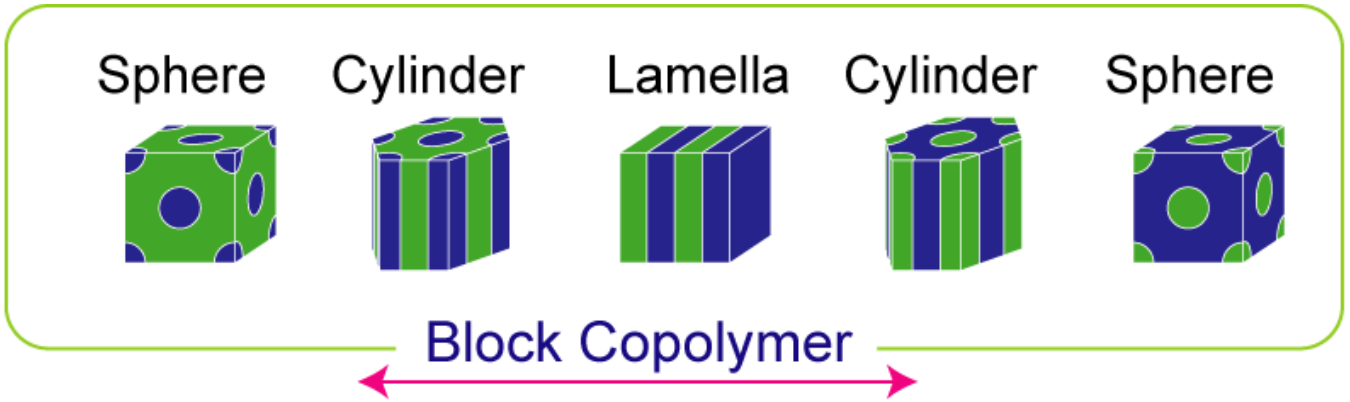
Introduction



Bottom-up method

Small molecule

10^3 10^2 10^1 10^0 10^{-1} nm

Lithography

Electron or Ion beams

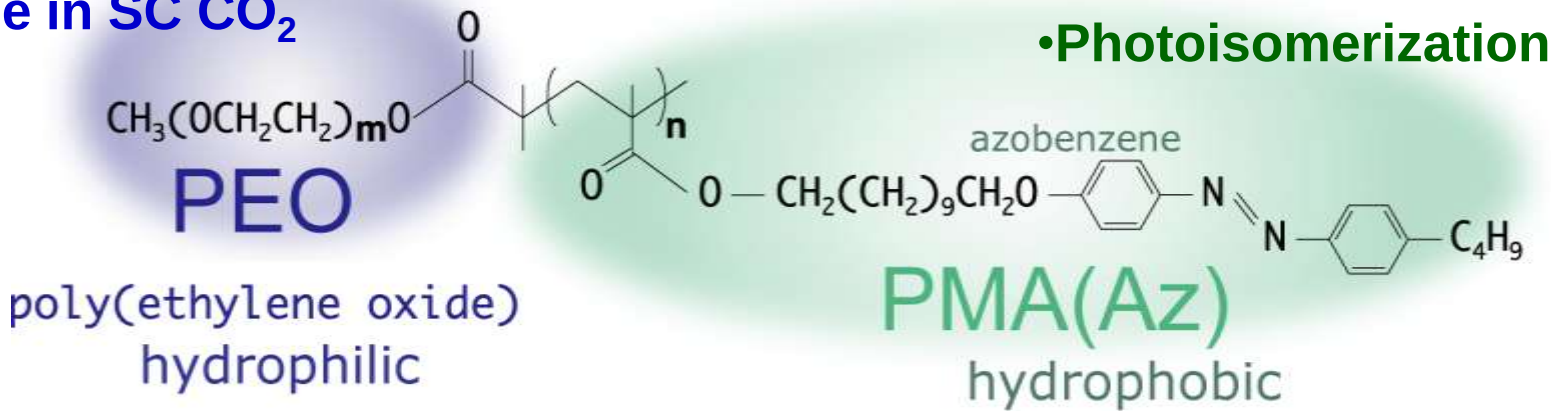
Top-down method

PEO_m-*b*-$PMA(Az)_n$

Side Chain Liquid Crystal di-block copolymer

- **Ion conductivity**
- **Molecular permeability**
- **Soluble in SC CO_2**

- **LC formation**
- **Photoisomerization**



Amphiphilicity

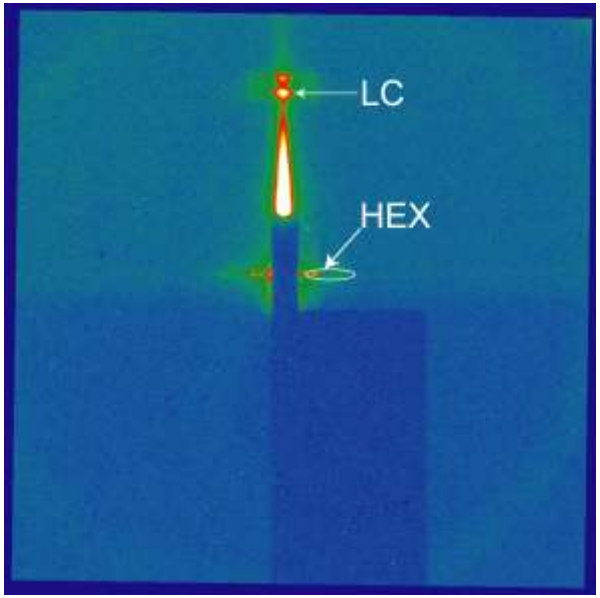
- **LB membranes**

Selective modification

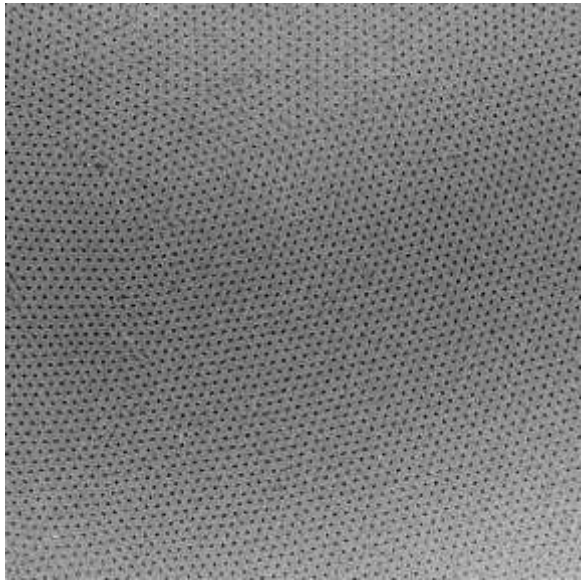
Macromolecules, **35**, 3739 (2002)

Introduction

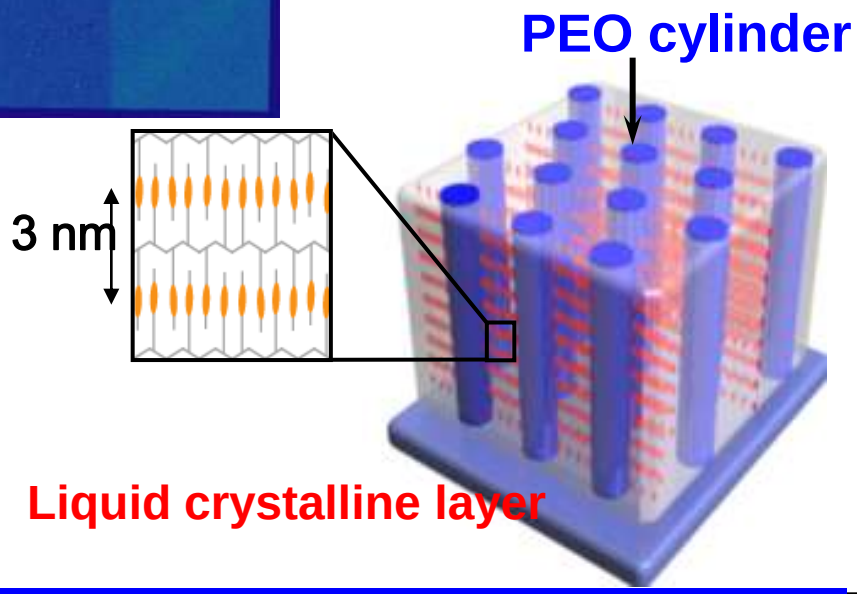
GISAXS



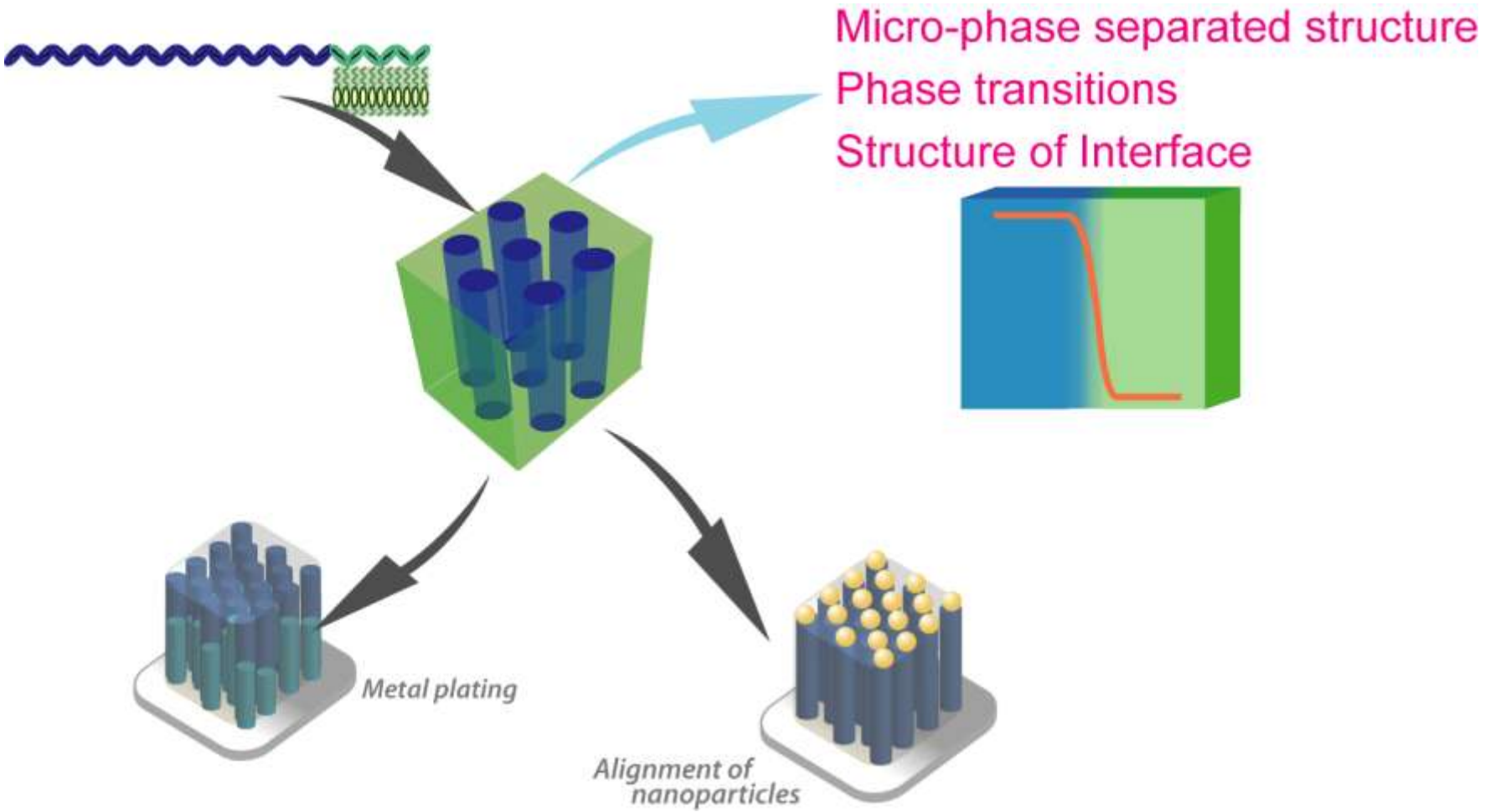
TEM



Trans. Mat. Res. Soc. Jpn., **30**, 377 (2005)



Target


Micro-phase separated structure
Phase transitions
Structure of Interface
Metal plating
Alignment of nanoparticles

Samples and Experiments

Samples

PEO_m-*b*-$PMA(Az)_n$ $(M_n / M_w < 1.2)$

m = 40, 114, 454

n = 10 ~ 180

Experiments

SAXS, DSC-SAXS

BL-10C (KEK, PF)

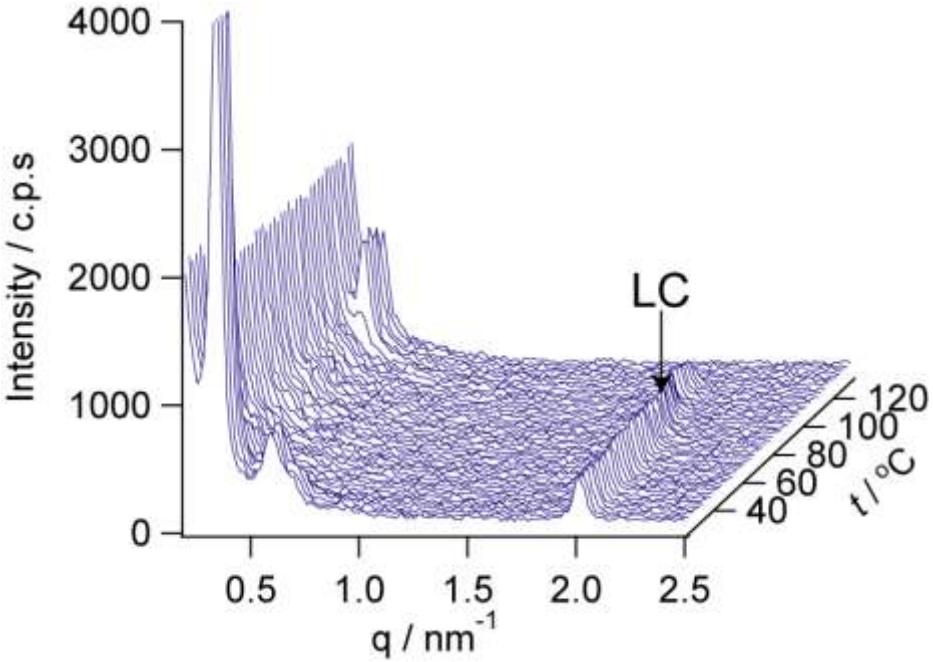
DSC

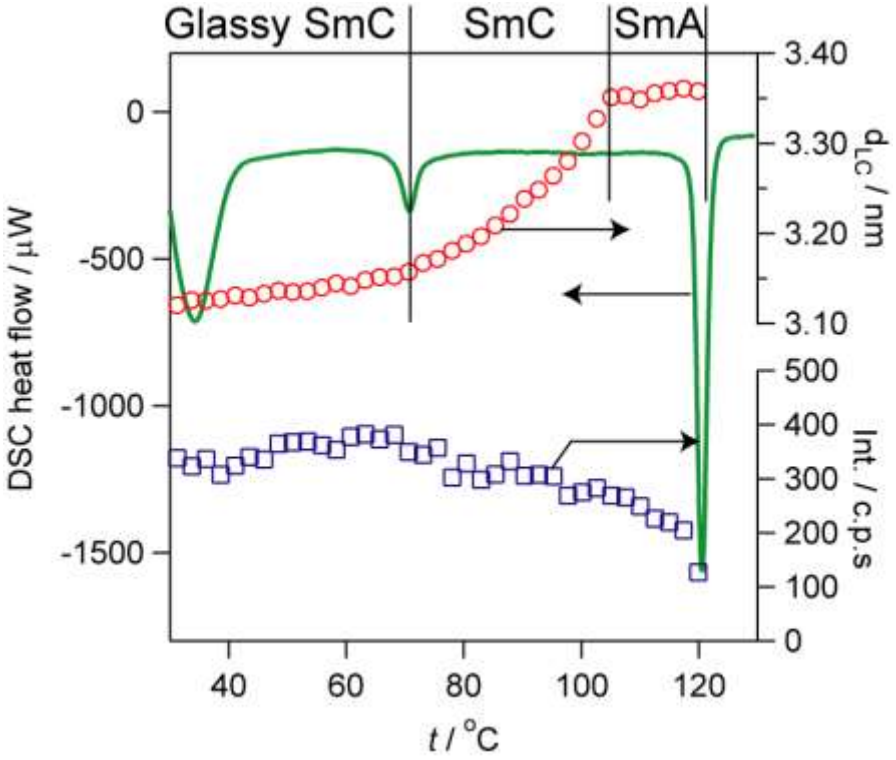
DSC 6200 (Seiko Instrument Inc.)

Range: -70^{o}C ~ 150^{o}C (10K min^{-1})

Simultaneous DSC-SAXS

PEO_{114}-*b*-$PMA(Az)_{54}$

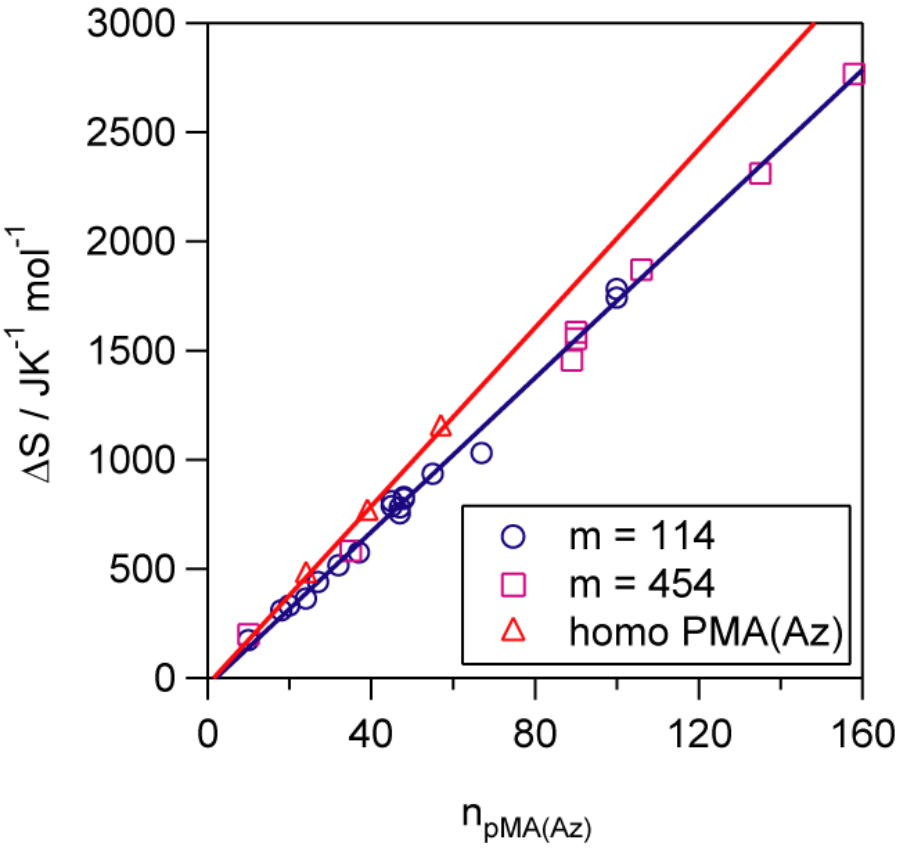




J. Therm. Anal. Cal., **85**, 713 (2006)

Structure of the Interface

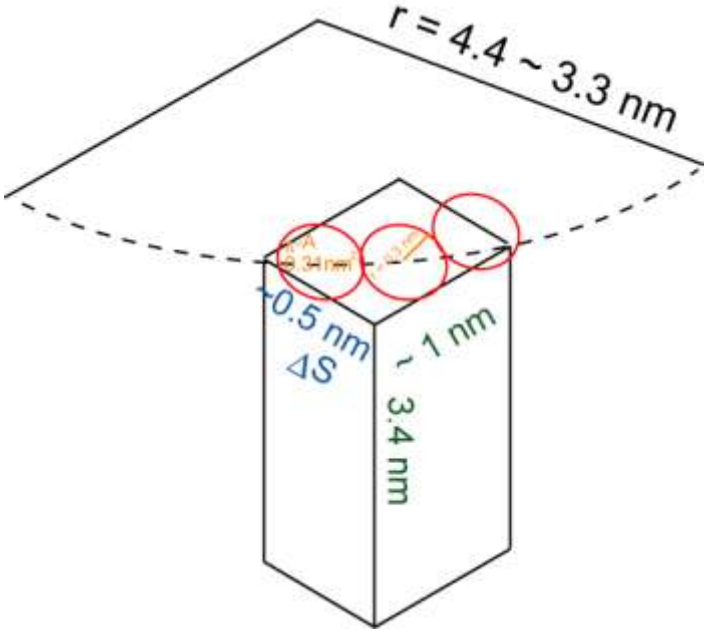
ΔS: Transition entropy of the isotropic transition



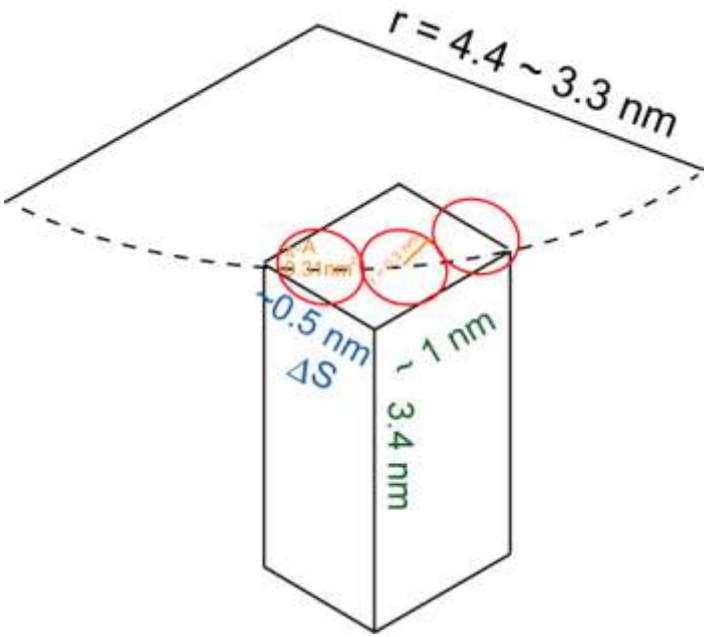
n* (ΔS = 0)

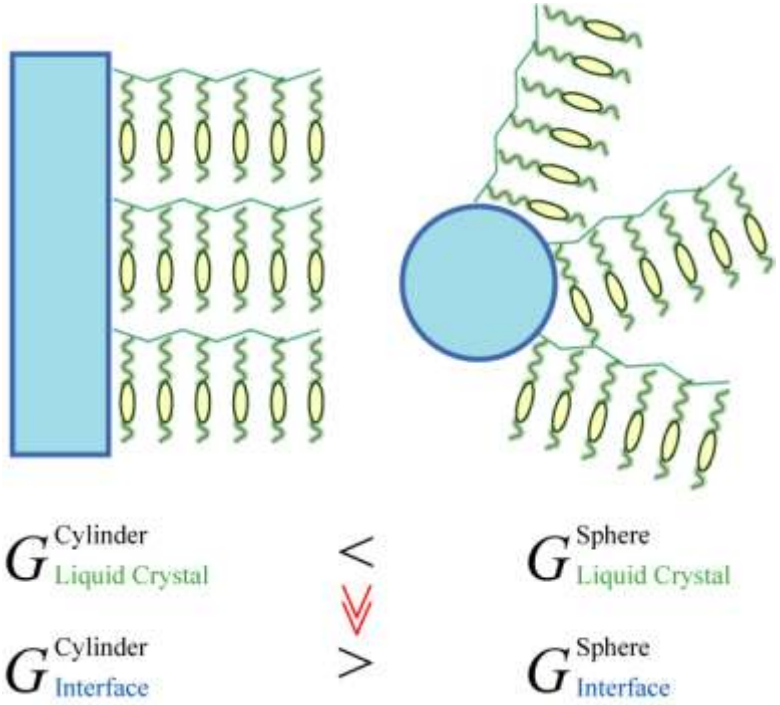
→ Thickness of the Interface

2 or 3 repeating units



Structure of the Interface

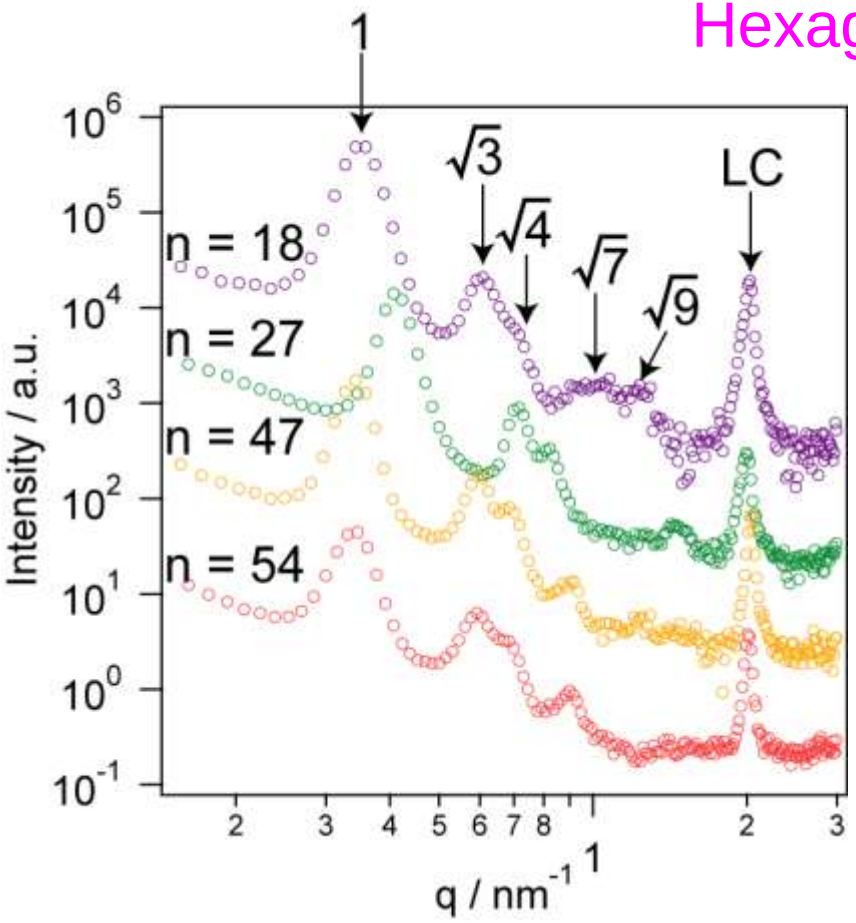




The interface of micro-phase separated structure consists of 2 ~ 3 repeating units and competes with the liquid crystal phase.

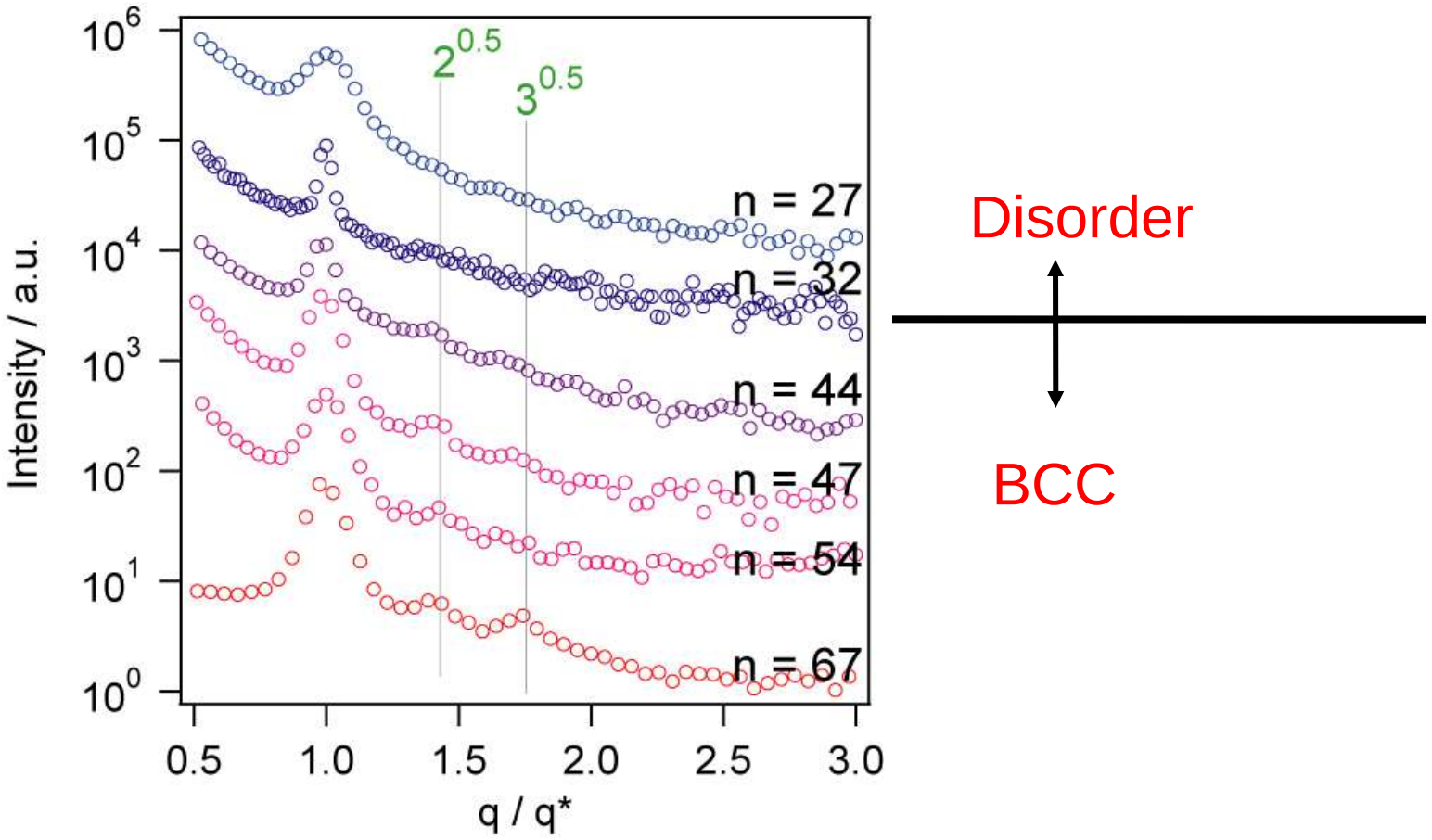
Micro-phase separated structure

Hexagonal cylinder structure



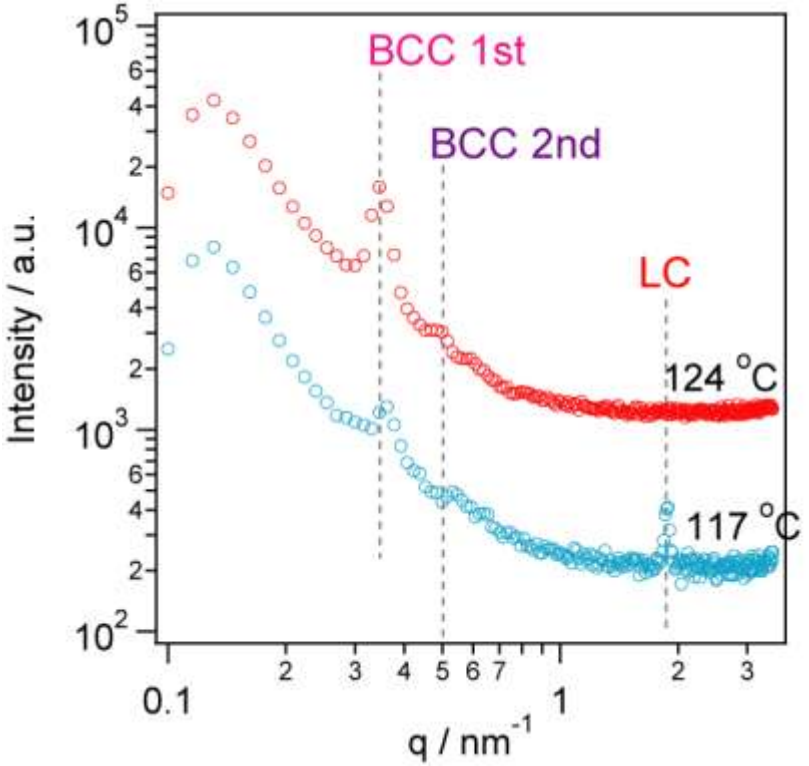
PEO_{114}-*b*-$PMA(Az)_n$@ R. T.

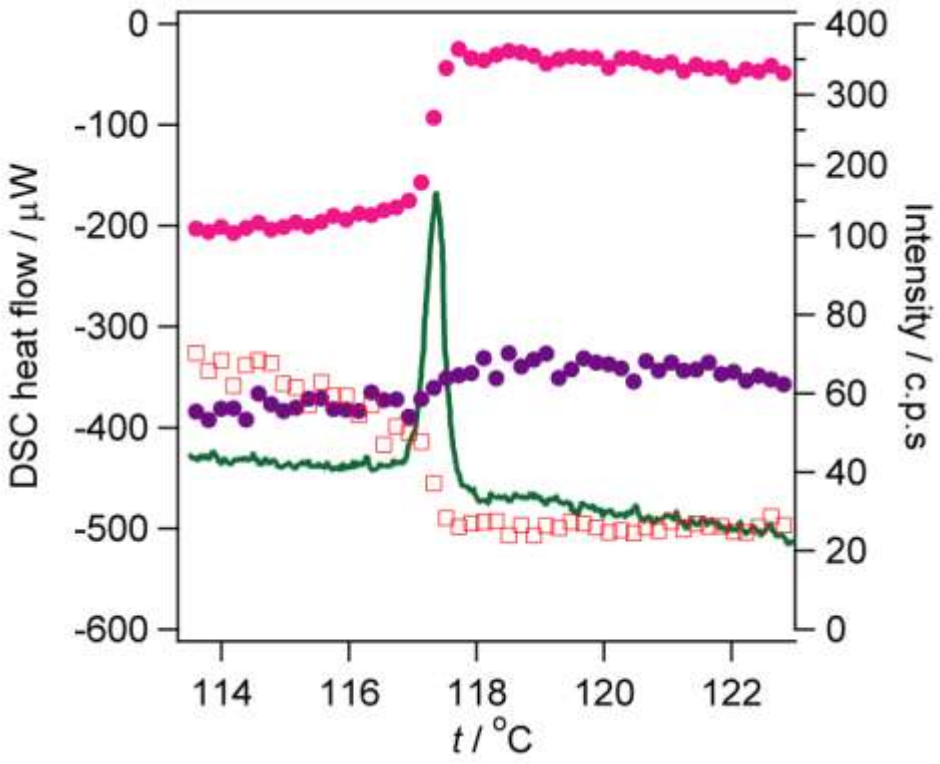
Micro-phase separated structure



Simultaneous DSC-SAXS

PEO_{114}-*b*-$PMA(Az)_{46}$





Order – order transition simultaneously occurred with the isotropic transition.

Phase Diagram