Synchrotron X-ray Scattering Studies of Nanostructures in Functional Polymers

Moonhor Ree*, Yecheol Rho, Byungcheol Ahn, Jungwoon Jung, Mihee Kim, and Sungmin Jung

Pohang Accelerator Laboratory, Division of Advanced Materials Science, Department of Chemistry, Center for Electro-Photo Behaviors in Advanced Molecular Systems, BK School of Molecular Science, and Polymer Research Institute, Pohang University of Science & Technology (POSTECH), Pohang 790-784, Republic of Korea

**E-mail: ree@postech.edu*

This presentation covers three different classes of novel functional polymers which can reveal beautiful nanostructures. The first class includes chemically well-defined functional polymers which have a strong tendency to self-assemble, producing nanostructures in various types. The second one is biomacromolecules (proteins and polynucleic acids (DNA and RNA), which are another type of chemically well-defined copolymers that can self-assemble with specific hydrogen bonding and chain conformation, forming attractive three-dimensional structures which perform biological functions. The final one includes block copolymers which can undergo phase-separation, forming a various types of nanostructures.

We carried out conventional and/or grazing incidence X-ray scattering measurements for polythiophene, polyoxyethylene, and polyvinyl derivaties and their blends and block copolymers. The measurements were conducted during heating and cooling runs in order to investigate structures and their assembly and disassembly mechanisms. Conventional X-ray scattering measurements were extended for proteins and polynucleic acids in physiological conditions and in binding with various ligands; moreover, their structural changes due to external factors were examined.

References:

[1] M. Kim et al., Biomacromolecules 2011, 12, 1629.
[2] K. Ohshimizu et al., Macromolecules 2011, 44, 719.
[3] B. Ahn et al., Macromolecules 2010, 43, 10568.
[4] T.J. Shin et al., Polymer 2010, 51, 5799.
[5] A. Takahashi et al., Macromolecules 2010, 43, 4843.
[6] S. Jin et al., J. Phys. Chem. B 2010, 114, 8033.
[7] K. S. Jin et al., J. Phys. Chem. B 2010, 114, 4783.
[8] G. Kim et al., Biomaterials 2010, 31, 3816.
[9] M. Shin et al., Adv. Funct. Mater. 2010, 20, 748.
[10] G. Kim et al., Adv. Funct. Mater. 2009, 19, 1631.
[11] S.R. Shin et al., Adv. Mater. 2009, 21, 1907.
[12] K.S. Jin et al., J. Phys. Chem. B. 2009, 113, 1852.
[13] T.J. Shin et al., J. Appl. Crystallogr. 2009, 42, 161.
[14] K.S. Jin et al., J. Phys. Chem. B. 2008, 112, 15821.
[15] J. Yoon et al., Macromolecules 2008, 41, 8778.
[16] Y/ Kim et al., Nature Materials 2006, 5, 197.
[17] B. Lee et al., Nature Materials 2005, 4, 147.