

# Changwoo Do

## *Curriculum Vitae*

Neutron Scattering Division  
Spallation Neutron Source  
Oak Ridge National Laboratory (UT-Battelle, LLC)  
P.O. Box 2008 MS 6473  
1 Bethel Valley Rd.  
Building 8600, Mail Stop 6473  
Oak Ridge, TN 37831-6473, USA

Office: +1-865-576-6981  
Cell: +1-865-314-9648  
Email: doc1@ornl.gov  
Alias: Changwoo Doe

## Education

- Ph.D. Nuclear and Quantum Engineering, KAIST, South Korea 2009**  
Thesis: Water-Redispersible Single-Walled Carbon Nanotubes and Their Self-Assembled Ordered Superstructures in Polymeric Systems.  
Advisor: Prof. Sung-Min Choi
- M.Sc. Physics, MIT, USA 2003**  
Thesis: Reciprocal Space Phase Gradient Neutron Imaging.  
Advisors: Prof. David G. Cory (supervisor), Prof. David E. Pritchard (co-supervisor)
- B.Sc. Physics, KAIST, South Korea 1999**  
Thesis: 2D Properties of Soft Matter Surface.  
Advisor: Prof. Mahn-Won Kim

## Professional Appointments

### **Scientific Staff, Spallation Neutron Source (UT-Battelle, LLC at the Oak Ridge National Laboratory, Oak Ridge, USA), 2011-present**

- Point of Contact of the EQ-SANS instrument. (2017-present)
- Instrument scientist for the EQ-SANS instrument at SNS (UT-Battle, LLC at the ORNL).
- *Beamline development*: Data acquisition/control system upgrade (EPICS). Sample environment development and upgrade (translation/vertical stage, rheo-sans, tensile stage). Data reduction software development and refinement. Data acquisition script development.
- *Science research*: Ion-transportation in polyelectrolyte solutions. Dynamics of molecules in highly concentrated salt solutions. Fabrication of self-assembled structures of soft materials and their structural characterization. Application of machine learning approaches to scattering data collection and analysis.

**Scientific Staff, JCNS-SNS, FZJ (UT-Battelle, LLC at the Oak Ridge National Laboratory, Oak Ridge, USA), 2010-2011**

- Investigation of the dynamics of polymer chains in Li ion batteries and block copolymer ternary systems using neutron spin echo (NSE) and small angle neutron scattering (SANS) techniques
- Instrument responsible for the NSE instrument at SNS (UT-Battelle, LLC at the ORNL).

**Postdoctoral Fellow, with Prof. Sung-Min Choi, KAIST, South Korea, 2009-2010**

- Small angle neutron/x-ray scattering study of interactions between functionalized carbon nanotubes in water using hydration layer model.
- Study of self-assembling behavior of single wall carbon nanotubes with various polymeric systems.

**Research Assistant, with Prof. Sung-Min Choi, KAIST, South Korea, 2003-2009**

- Fabrication of highly ordered and self-assembled superstructures of functionalized carbon nanotubes in polymeric systems and their characterization with small angle neutron and X-ray scattering techniques.
- Dispersion of carbon nanotubes with surface charge control and its characterization with a small angle neutron scattering technique.
- Development of preliminary neutron spin-echo instrument at HANARO research reactor.

**Research Assistant, with Prof. David G. Cory, MIT, USA, 2001-2003**

- Development of a reciprocal space neutron imaging technique using the neutron interferometry tool.

**Research Assistant, with Prof. Michael S. Feld, MIT, USA, 1999-2001**

- Investigation of optical properties of biotissues using laser spectroscopy.

**Grants and Awards**

- LDRD Fund (LDRD-9852, co-PI), Welding Interfaces for a New Plastics Economy (2020-2021)
- LDRD Fund (LDRD-9458, co-PI), Molecular Understanding of Soft Matter Flow and Deformation with Neutrons (2019-2021)
- LDRD Fund (LDRD-7641, co-PI), High-Resolution Small/Wide Angle Neutron Scattering for Atomic-to-Mesoscale Structure in Complex Soft Materials and Biology (HiRes-SWANS) (2015-2017)
- LDRD Fund (LDRD-6544, co-PI), Understanding and controlling the nano- to mesoscale evolution of structure and function in electroactive molecules during thin film formation (2013-2014)
- SEED Money Fund (SEED-6644, PI), Fabrication of Self-Assembled Superstructures of Opto-Electronic Polymers in Amphiphilic Block Polymeric Systems and Investigation of Their Structures by Small Angle Neutron Scattering (2012-2013)
- Research Grant Award, National Research Foundation of Korea (2010)
- Best poster award in 7th Japan-Korea Meeting on Neutron Science (2007)
- Nuclear and Quantum Engineering Department Fellowship (2004)

## Professional Roles

- Point of Contact, EQ-SANS Instrument (2017-present)
- Committee member for SEED funding at ORNL (2017-present)
- Workshop organizer for
  - New Science Opportunities with Time-of-Flight Wide-Angle Neutron Spin-Echo at STS (Feb 2021)
  - Current and Future Development of Neutron Scattering Techniques for Time-Resolved Studies, ORNL (Oct 2019)
  - Time-Resolved Neutron Scattering workshop, ORNL (Apr 2018)
  - Neutron Spin Echo for Slow Dynamics Investigation Workshop, ORNL (Nov 2016)
  - Future and Current Use of Neutron Spin-Echo Spectroscopy in Condensed Matter Research, ORNL (May 2015)
- Sample Environment Committee, NScD ORNL (2015-2018)

## Teaching Experience

### •**Lecturer, The 4<sup>th</sup> Soft Matter Summer School, 2016. 7. 4-14**

Lectures on neutron scatterings and polyelectrolyte systems. (English)

### •**Teaching Assistant, National School on Neutron and X-Ray Scattering, 2013, 2014, 2015, 2016**

Tutorial sessions on SANS data acquisition and analysis. (English)

### •**Teaching Assistant, Neutrons in Structural Biology School, 2012. 6. 4-8**

Performed a recitation section for SANS data analysis and data fitting. (English)

### •**Research Advisor, Undergraduate Research Program, 2008-2009**

Advised undergraduate research program on the development of Monte Carlo simulation method of small-angle neutron scattering intensities for nanoparticles with arbitrary shape (Excellence in Research Award was given to the student)

### •**Teaching Assistant, Neutron Summer School (Asia-Oceania Neutron Scattering Association), 2008**

Performed a recitation section for analysis methods of small angle neutron scatterings to international students from various countries. (English)

### •**Teaching Assistant, Introduction to Nuclear Physics and Quantum Mechanics (English), 2004-2005**

Performed a recitation section for quantum mechanics and substitute lectures.

### •**Teaching Assistant, Neutron Optics, 2004**

Performed a recitation section and substitute lectures regarding neutron scattering theory.

## Reviewers

- *Langmuir, Chemical Physics, Journal of Applied Crystallography, Polymer, Langmuir, Journal of Polymer Physics, Physical Chemistry and Chemical Physics, Review of Scientific Instruments, ACS Macro Letter, Nature Physics*
- *Oak Ridge National Laboratory, SEED Fund Proposal Reviews*
- *DOE R&D Proposal Review*

## Mentoring

### Post-doctoral researchers

Zhe Zhang (2012-2015, Current: NIST, Gathersburg, MD)

Youngkyu Han (2013-2016, Current: Amore Pacific Inc., South Korea)

Taehui Kang (2014-2017, Current: Seogang University, South Korea)

### Graduate Students

Boyang Zhou (2018-, Georgia Tech, Atlanta, GA). GO student with Prof. Alberto Fernandez Nieve.

## Published Papers

- (1) Doe, C. K.; Woo, D. C.; Choi, S. M.; Moon, M. K.; Lee, C. H. First Neutron Spin-Echo Measurement at HANARO. *J. Korean Phys. Soc.* **2005**, *46*, 1075–1079.
- (2) Pushin, D. A.; Arif, M.; Jacobson, D. L.; Doe, C. K.; Cory, D. G. Reciprocal Space Neutron Imaging. *Phys. B* **2006**, 385–386, 1402–1404.
- (3) Kim, T.-H.; Doe, C.; Kline, S. R.; Choi, S.-M. Water-Redispersible Isolated Single-Walled Carbon Nanotubes Fabricated by In Situ Polymerization of Micelles. *Adv. Mater.* **2007**, *19*, 929–933.
- (4) Doe, C.; Choi, S.-M.; Kline, S. R.; Jang, H.-S.; Kim, T.-H. Charged Rod-Like Nanoparticles Assisting Single-Walled Carbon Nanotube Dispersion in Water. *Adv. Funct. Mater.* **2008**, *18*, 2685–2691.
- (5) Kim, T.-H.; Doe, C.; Kline, S. R.; Choi, S.-M. Organic Solvent-Redispersible Isolated Single Wall Carbon Nanotubes Coated by in-Situ Polymerized Surfactant Monolayer. *Macromolecules* **2008**, *41* (9), 3261–3266.
- (6) Doe, C.; Jang, H.-S.; Kim, T.-H.; Kline, S. R.; Choi, S.-M. Thermally Switchable One- and Two-Dimensional Arrays of Single-Walled Carbon Nanotubes in a Polymeric System. *J. Am. Chem. Soc.* **2009**, *131*, 16568–16572.
- (7) Choi, S.-M.; Do, C.; Han, Y.-S. Soft Nanomaterials Research Using Small Angle Neutron Scatterings. *물리학과 첨단기술*. 2009, pp 24–29.

- (8) Doe, C.; Jang, H.-S.; Kline, S. R.; Choi, S.-M. Subdomain Structures of Lamellar and Reverse Hexagonal Pluronic Ternary Systems Investigated by Small Angle Neutron Scattering. *Macromolecules* **2009**, *42*, 2645–2650.
- (9) Kim, T.-H.; Kang, S.-H.; Doe, C.; Yu, J.; Sim, J.-B.; Kim, J.; Kline, S. R.; Choi, S.-M. Highly Ordered Self-Assembly of 1D Nanoparticles in Phospholipids Driven by Curvature and Electrostatic Interaction. *J. Am. Chem. Soc.* **2009**, *131*, 7456–7460.
- (10) Doe, C.; Jang, H.-S.; Kline, S. R.; Choi, S.-M. SANS Investigation of Selectively Distributed Single-Walled Carbon Nanotubes in a Polymeric Lamellar Phase. *Macromolecules* **2010**, *43* (12), 5411–5416. <https://doi.org/10.1021/ma1003419>.
- (11) Lee, J.-H.; Choi, S.-M.; Doe, C.; Faraone, A.; Pincus, P. a.; Kline, S. R. Thermal Fluctuation and Elasticity of Lipid Vesicles Interacting with Pore-Forming Peptides. *Phys. Rev. Lett.* **2010**, *105* (3), 38101. <https://doi.org/10.1103/PhysRevLett.105.038101>.
- (12) Wu, B.; Li, X.; Do, C.; Kim, T.-H.; Shew, C.-Y.; Liu, Y.; Yang, J.; Hong, K.; Porcar, L.; Chen, C.-Y.; Liu, E. L.; Smith, G. S.; Herwig, K. W.; Chen, W.-R. Spatial Distribution of Intra-Molecular Water and Polymeric Components in Polyelectrolyte Dendrimers Revealed by Small Angle Scattering Investigations. *J. Chem. Phys.* **2011**, *135*, 144903.
- (13) Shew, C.-Y.; Do, C.; Hong, K.; Liu, Y.; Porcar, L.; Smith, G. S.; Chen, W.-R. Conformational Effect on Small Angle Neutron Scattering Behavior of Interacting Polyelectrolyte Solutions: A Perspective of Integral Equation Theory. *J. Chem. Phys.* **2012**, *137* (2), 024907. <https://doi.org/10.1063/1.4732516>.
- (14) Kim, T.-H.; Do, C.; Kang, S.-H.; Lee, M.-J.; Lim, S.-H.; Choi, S.-M. Highly Ordered Superstructures of Single Wall Carbon Nanotube-Liposome Complexes. *Soft Matter* **2012**, *8* (35), 9073. <https://doi.org/10.1039/c2sm25827g>.
- (15) Jang, H.-S.; Do, C.; Kim, T.-H.; Choi, S.-M. Single-Walled Carbon Nanotube-Induced Lyotropic Phase Behavior of a Polymeric System. *Macromolecules* **2012**, *45* (2), 986–992. <https://doi.org/10.1021/ma2021166>.
- (16) Wu, B.; Kerkeni, B.; Egami, T.; Do, C.; Liu, Y.; Wang, Y. M.; Porcar, L.; Hong, K. L.; Smith, S. C.; Liu, E. L.; Smith, G. S.; Chen, W. R. Structured Water in Polyelectrolyte Dendrimers: Understanding Small Angle Neutron Scattering Results through Atomistic Simulation. *J. Chem. Phys.* **2012**, *136* (14), 144901. <https://doi.org/Artn 144901> Doi 10.1063/1.3697479.
- (17) Wu, B.; Chen, W.-R.; Egami, T.; Li, X.; Liu, Y.; Wang, Y.; Do, C.; Porcar, L.; Hong, K.; Liu, L.; Smith, G. S.; Smith, S. C. Molecular Dynamics and Neutron Scattering Study of the Dependence of Polyelectrolyte Dendrimer Conformation on Counterion Behavior. *J. Chem. Phys.* **2012**, *137* (6), 064902. <https://doi.org/10.1063/1.4742190>.
- (18) McCulloch, B.; Ho, V.; Hoarfrost, M.; Stanley, C.; Do, C.; Heller, W. T.; Segalman, R. A. Polymer Chain Shape of Poly(3-Alkylthiophenes) in Solution Using Small-Angle Neutron Scattering. *Macromolecules* **2013**, *46* (5), 1899–1907.

- (19) Wu, B.; Liu, Y.; Li, X.; Mamontov, E.; Kolesnikov, A. I.; Diallo, S. O.; Do, C.; Porcar, L.; Hong, K.; Smith, S. C.; Liu, L.; Egami, T.; Chen, W. Charge-Dependent Dynamics of a Polyelectrolyte Dendrimer and Its Correlation with Invasive Water. *J. Am. Chem. Soc.* **2013**, *135* (13), 5111–5117.
- (20) Jang, H.-S.; Kim, T.-H.; Do, C.; Lee, M.-J.; Choi, S.-M. Single-Walled Carbon Nanotube Induced Re-Entrant Hexagonal Phases in a Pluronic Block Copolymer System. *Soft Matter* **2013**, *9* (11), 3050. <https://doi.org/10.1039/c3sm27589b>.
- (21) Do, C.; Jang, H.-S.; Choi, S.-M. Hydration Forces between Surfaces of Surfactant Coated Single-Walled Carbon Nanotubes. *J. Chem. Phys.* **2013**, *138* (11), 114701. <https://doi.org/10.1063/1.4793763>.
- (22) Do, C.; Chen, W.-R.; Hong, K.; Smith, G. S. Equilibrium Structure of a Triblock Copolymer System Revealed by Mesoscale Simulation and Neutron Scattering. *Phys. B Condens. Matter* **2013**, *430*, 87–94. <https://doi.org/10.1016/j.physb.2013.08.019>.
- (23) Do, C.; Heller, W. T.; Stanley, C.; Gallmeier, F. X.; Doucet, M.; Smith, G. S. Understanding Inelastically Scattered Neutrons from Water on a Time-of-Flight Small-Angle Neutron Scattering (SANS) Instrument. *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.* **2013**, *737*, 42–46. <https://doi.org/10.1016/j.nima.2013.11.030>.
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- (26) Zhang, Z.; Carrillo, J.-M. Y.; Ahn, S.; Wu, B.; Hong, K.; Smith, G. S.; Do, C. Atomistic Structure of Bottlebrush Polymers: Simulations and Neutron Scattering Studies. *Macromolecules* **2014**, *47* (16), 5808–5814. <https://doi.org/10.1021/ma500613c>.
- (27) Ahn, S.; Carrillo, J.-M. Y.; Han, Y.; Kim, T.-H.; Uhrig, D.; Pickel, D. L.; Hong, K.; Kilbey, S. M.; Sumpter, B. G.; Smith, G. S.; Do, C. Structural Evolution of Polylactide Molecular Bottlebrushes: Kinetics Study by Size Exclusion Chromatography, Small Angle Neutron Scattering, and Simulations. *ACS Macro Lett.* **2014**, *3* (9), 862–866. <https://doi.org/10.1021/mz5003454>.
- (28) Li, X.; Sánchez-Diáz, L. E.; Wu, B.; Hamilton, W. a.; Falus, P.; Porcar, L.; Liu, Y.; Do, C.; Faraone, A.; Smith, G. S.; Egami, T.; Chen, W.-R. Dynamical Threshold of Diluteness of Soft Colloids. *ACS Macro Lett.* **2014**, *3* (12), 1271–1275. <https://doi.org/10.1021/mz500500c>.
- (29) Li, X.; Porcar, L.; Sánchez-Diáz, L. E.; Do, C.; Liu, Y.; Kim, T.-H.; Smith, G. S.; Hamilton, W. A.; Hong, K.; Chen, W.-R. Influence of Molecular Solvation on the Conformation of Star Polymers. *ACS Macro Lett.* **2014**, *3* (5), 458–461. <https://doi.org/10.1021/mz500182m>.

- (30) Shao, M.; Keum, J. K.; Kumar, R.; Chen, J.; Browning, J. F.; Das, S.; Chen, W.; Hou, J.; Do, C.; Littrell, K. C.; Rondinone, A.; Geohegan, D. B.; Sumpter, B. G.; Xiao, K. Understanding How Processing Additives Tune the Nanoscale Morphology of High Efficiency Organic Photovoltaic Blends: From Casting Solution to Spun-Cast Thin Film. *Adv. Funct. Mater.* **2014**, *24* (42), 6647–6657. <https://doi.org/10.1002/adfm.201401547>.
- (31) Li, X.; Do, C.; Liu, Y.; Sánchez-Diáz, L.; Smith, G.; Chen, W.-R. A Scattering Function of Star Polymers Including Excluded Volume Effects. *J. Appl. Crystallogr.* **2014**, *47* (6), 1901–1905. <https://doi.org/10.1107/S1600576714022249>.
- (32) Lipfert, F.; Holderer, O.; Frielinghaus, H.; Appavou, M.-S.; Do, C.; Ohl, M.; Richter, D. Long Wavelength Undulations Dominate Dynamics in Large Surfactant Membrane Patches. *Nanoscale* **2014**, *7* (6), 2578–2586. <https://doi.org/10.1039/c4nr06278g>.
- (33) Das, S.; Keum, J. K.; Browning, J. F.; Gu, G.; Yang, B.; Dyck, O.; Do, C.; Chen, W.; Chen, J.; Ivanov, I. N.; Hong, K.; Rondinone, A. J.; Joshi, P. C.; Geohegan, D. B.; Duscher, G.; Xiao, K. Correlating High Power Conversion Efficiency of PTB7:PC71BM Inverted Organic Solar Cells with Nanoscale Structures. *Nanoscale* **2015**. <https://doi.org/10.1039/c5nr03332b>.
- (34) Zhu, J.; Han, Y.; Kumar, R.; He, Y.; Hong, K.; Bonnesen, P. V.; Sumpter, B. G.; Smith, S. C.; Smith, G. S.; Ivanov, I. N.; Do, C. Controlling Molecular Ordering in Solution-State Conjugated Polymers. *Nanoscale* **2015**, *7*, 15134–15141. <https://doi.org/10.1039/c5nr02037a>.
- (35) Chen, X.; Khajeh, J. A.; Ju, J. H.; Gupta, Y. K.; Stanley, C. B.; Do, C.; Heller, W. T.; Aggarwal, A. K.; Callaway, D. J. E.; Bu, Z. Phosphatidylinositol 4,5-Bisphosphate Clusters the Cell Adhesion Molecule CD44 and Assembles a Specific CD44-Ezrin Heterocomplex, as Revealed by Small Angle Neutron Scattering. *J. Biol. Chem.* **2015**, *290* (10), 6639–6652. <https://doi.org/10.1074/jbc.M114.589523>.
- (36) Sun, C.-N.; Zawodzinski, T. A.; Tenhaeff, W. E.; Ren, F.; Keum, J. K.; Bi, S.; Li, D.; Ahn, S.-K.; Hong, K.; Rondinone, A. J.; Carrillo, J.-M. Y.; Do, C.; Sumpter, B. G.; Chen, J. S. Nanostructure Enhanced Ionic Transport in Fullerene Reinforced Solid Polymer Electrolytes. *Phys. Chem. Chem. Phys.* **2015**, *17* (12), 8266–8275. <https://doi.org/10.1039/C4CP05583G>.
- (37) He, L.; Do, C.; Qian, S.; Wignall, G. D.; Heller, W. T.; Littrell, K. C.; Smith, G. S. Corrections for the Geometric Distortion of the Tube Detectors on SANS Instruments at ORNL. *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.* **2015**, *775*, 63–70. <https://doi.org/10.1016/j.nima.2014.11.061>.
- (38) Han, Y.; Ahn, S.; Zhang, Z.; Smith, G. S.; Do, C. Tunable Encapsulation Structure of Block Copolymer Coated Single-Walled Carbon Nanotubes in Aqueous Solution. *Macromolecules* **2015**, *48* (11), 3475–3480. <https://doi.org/10.1021/acs.macromol.5b00456>.
- (39) Hyatt, J. S.; Do, C.; Hu, X.; Choi, H. S.; Kim, J. W.; Lyon, L. A.; Fernandez-Nieves, A. Segregation of Mass at the Periphery of  $N$ -Isopropylacrylamide-Co-Acrylic-Acid Microgels at High Temperatures. *Phys. Rev. E* **2015**, *92* (3), 030302. <https://doi.org/10.1103/PhysRevE.92.030302>.

- (40) Zhang, Z.; Ohl, M.; Diallo, S. O.; Jalarvo, N. H.; Hong, K.; Han, Y.; Smith, G. S.; Do, C. Dynamics of Water Associated with Lithium Ions Distributed in Polyethylene Oxide. *Phys. Rev. Lett.* **2015**, *115* (19), 198301. <https://doi.org/10.1103/PhysRevLett.115.198301>.
- (41) Jalarvo, N.; Pramanick, A.; Do, C.; Diallo, S. O. Effects of Configurational Changes on Molecular Dynamics in Polyvinylidene Fluoride and Poly(Vinylidene Fluoride-Trifluoroethylene) Ferroelectric Polymers. *Appl. Phys. Lett.* **2015**, *107* (8), 082907. <https://doi.org/10.1063/1.4929693>.
- (42) Han, Y.; Carrillo, J.-M. Y.; Zhang, Z.; Li, Y.; Hong, K.; Sumpter, B. G.; Ohl, M.; Paranthaman, M. P.; Smith, G. S.; Do, C. Self-Assembly: Thermoreversible Morphology and Conductivity of a Conjugated Polymer Network Embedded in Block Copolymer Self-Assemblies (Small 35/2016). *Small* **2016**, *12* (35), 4775–4775. <https://doi.org/10.1002/smll.201670174>.
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- (44) Li, A.; Lu, L.; Li, X.; He, L.; Do, C.; Garno, J. C.; Zhang, D. Amidine-Mediated Zwitterionic Ring-Opening Polymerization of *N*-Alkyl *N*-Carboxyanhydride: Mechanism, Kinetics, and Architecture Elucidation. *Macromolecules* **2016**, *49* (4), 1163–1171. <https://doi.org/10.1021/acs.macromol.5b02611>.
- (45) Arai, K.; Sagawa, N.; Shikata, T.; Sternhagen, G. L.; Li, X.; Guo, L.; Do, C.; Zhang, D. Pronounced Dielectric and Hydration/Dehydration Behaviors of Monopolar Poly(*N*-Alkylglycine)s in Aqueous Solution. *J. Phys. Chem. B* **2016**, *acs.jpcc.6b05379*. <https://doi.org/10.1021/acs.jpcc.6b05379>.
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- (54) Huang, G.-R.; Wang, Y.; Wu, B.; Wang, Z.; Do, C.; Smith, G. S.; Bras, W.; Porcar, L.; Falus, P.; Chen, W.-R. Reconstruction of Three-Dimensional Anisotropic Structure from Small-Angle Scattering Experiments. *Phys. Rev. E* **2017**, *96* (2), 022612. <https://doi.org/10.1103/PhysRevE.96.022612>.
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- (87) Peter Kei, Mitchell Howell, Carlos Chavez, Joseph Mai, Changwoo Do, Kunlun Hong, Evgueni Nesterov, Kinetically controlled formation of semi-crystalline conjugated polymer nanostructures, *Macromolecules*, **54**, 5, 2162-2177 (2021)
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- (??) Hobyung Chae, E-Wen Huang, Mao Yuan Luo, Eunjoo Shin, Changwoo Do, Soon-Ku Hong, Wanchuck Woo, Sooyeol Lee, Unearthing principal strengthening factors tuning the additive manufactured stainless steel, *Int. J. Machine Tools and Manufacture* (submitted 20201207)
- (??) Kang, TaeHui; Jeon, Yoonnam; Qian, Shuo; Do, Changwoo; Heller, William T.; Kim, Mahn Won. Temperature-Induced Phase Transition and Structural Change in an Ionic Liquid Microemulsion System (submitted)
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### Journal covers

- Han, Y., Zhang, Z., Smith, G. & Do, C. Effect of nucleoside analogue antimetabolites on the structure of PEO-PPO-PEO micelles investigated by SANS. *Phys. Chem. Chem. Phys.* **19**, 15686–15692 (2017).
- Han, Y. *et al.* Self-Assembly: Thermoreversible Morphology and Conductivity of a Conjugated Polymer Network Embedded in Block Copolymer Self-Assemblies (*Small* 35/2016). *Small* **12**, 4775–4775 (2016).
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- Das, S. *et al.* Correlating high power conversion efficiency of PTB7:PC71BM inverted organic solar cells with nanoscale structures. *Nanoscale* (2015). doi:10.1039/c5nr03332b
- Do, C., Jang, H.-S. & Choi, S.-M. Hydration forces between surfaces of surfactant coated single-walled carbon nanotubes. *J. Chem. Phys.* **138**, 114701 (2013).

### Presentations and Invited Talks

“Application of Deep Learning and Machine Learning for Accelerated Data Collection and Analysis of Small-Angle Neutron Scattering Data” **Changwoo Do**, Wei-Ren Chen, Sangkeun Lee, Yi Wei, Ming-Ching Chang, MRS Fall Meeting 2019, Boston, MA, Dec 5, 2019.

“Structure and Dynamics of Soft Materials Investigated by Neutron Scattering” Polymer Day at ORNL, May 29, 2018. (invited talk)

“Thermo-responsive templates for conjugate polymer self-assemblies using block copolymers in aqueous solution” 255<sup>th</sup> ACS Meeting, X-ray & Neutron Scattering in Energy Technologies, New Orleans, LA, Mar 21, 2018. (invited talk)

“Thermo-Responsive Templates for Soft Matter Self-Assemblies.” 2017 Joint Nanoscience and Neutron Scattering User Meeting, Aug 1, 2017. (invited talk)

“Synergic Use of Computer Simulations in Neutron Scattering Investigations of Soft Materials.” ICNS 2017, July 10, 2017.

“Understanding Soft Materials by Neutron Scattering and Computer Simulations.” HANARO, KAERI, Daejeon, South Korea, Aug 3, 2016. (invited talk)

“Polymer and Surfactant Self-Assemblies.” Louisiana State University, Joint Macro/LaCNS Seminar Series, March 11, 2016. (invited talk)

“Polymer and Surfactant Self-Assemblies.” Georgia Tech, ORNL-Georgia Tech Joint Workshop in Neutron Science and Scattering, Jan 27, 2016. (invited talk)

“Understanding inelastically scattered neutrons from water on a time-of-flight small-angle neutron scattering (SANS) instrument.” Indiana University, LENS/Condensed Matter Physics Seminars, Jan 23, 2015. (invited talk)

“Inelastically scattered neutrons at TOF-SANS.” **Changwoo Do**, William T. Heller, Christopher Stanley, Franz X. Gallmeier, Mathieu Doucet, Gregory S. Smith, *ACNS 2014*, 2014 (oral)

“Dynamics of Water in Polyethylene Oxide (PEO) Matrix in the Presence of Li<sup>+</sup> Ions.” Zhe Zhang, Kunlun Hong, Souleymane Omar Diallo, Niina Jalarvo, Gregory Smith, Michael Ohl, **Changwoo Do**, *ACNS 2014*, 2014 (oral)

“Effect of temperature on the structure of Pluronic polymers encapsulating SWNT in aqueous solution.” Youngkyu Han, Suk-kyun Ahn, Gregory Smith, **Changwoo Do**, *ACNS 2014*, 2014 (poster)

“Structural Evolution of Polyactide Molecular Brushes: Kinetics study by size exclusion chromatography, small-angle neutron scattering and simulation.” Suk-kyun Ahn, Jan-Michael Carrillo, Youngkyu Han, Tae-Hwan Kim, Kunlun Hong, S. Michael Kilbey II, Bobby Sumpter, Gregory Smith, **Changwoo Do**, *ACNS 2014*, 2014 (poster)

“Molecular Dynamics Simulations and Neutron Scattering Studies for Bottlebrush Polymers.” Zhe Zhang, Suk-kyun Ahn, Jan-Michael Carrillo, Bin Wu, Kunlun Hong, Gregory Smith, **Changwoo Do**, *ACNS 2014*, 2014 (poster)

“Dynamics of intrinsically disordered proteins probed with neutron spin-echo spectroscopy.” Laura Stingaciu, Andreas Stadler, Ralf Biehl, **Changwoo Do**, Dieter Richter, Michael Ohl, *ICNS 2013, 2013 (poster)*

“Integral equation theory for star and linear polyelectrolyte solutions.” **Changwoo Do**, Gregory Smith, Wei-Ren Chen, Chwen-Yang Shew, Kunlun Hong, Yun Liu, Lionel Porcar, *ACNS 2012, Washington DC, June 25, 2012 (talk)*

“Understanding Li<sup>+</sup> Transportation in Solid Polyelectrolytes.” **Changwoo Do** (PI), Diddo Diddens, Peter Lunkenheimer, Michael Ohl, Xiao-Guang Sun, Jürgen Allgaier, Marion Götz, Alois Loidl, Dieter Richter, *ACNS 2012, Washington DC, June 25, 2012 (poster)*

“Influence of LiTFSI on the Dynamics of PEO Investigated by Neutron Scatterings at SNS.” **C. Do** et al. *Gordon Research Conference, Ventura, February 5, 2012 (poster)*

“Contrast Varied SANS Investigation of Sub-domain Structures of Lamellar and Reverse Hexagonal Pluronic Ternary Systems.” **C. Doe**, H.-S. Jang, S.R. Kline, S.-M. Choi. *HANARO Symposium 2010, Nov. 1-2, 2010, Daejeon Convention Center, Daejeon, Republic of Korea (poster)*

“Contrast Varied SANS Investigation of Single-Walled Carbon Nanotubes in a Polymeric Lamellar System.” **C. Doe**, H.-S. Jang, S.R. Kline, S.-M. Choi. *HANARO Symposium 2010, Nov. 1-2, 2010, Daejeon Convention Center, Daejeon, Republic of Korea (poster)*

“Fabrication of highly ordered SWNT superstructures in a polymeric system.” **C. Doe**, H.-S. Jang, T.-H. Kim, S.R. Kline, and S.-M. Choi. *The 10th Conference of the Asian Crystallographic Association (AsCA 2010), Oct. 31 - Nov. 3, 2010, BEXCO, Busan, Republic of Korea (poster)*

“Thermoreversible Highly Ordered SWNT Superstructures in a Polymeric System.” **C. Doe**, H.-S. Jang, T.-H. Kim, S.R. Kline, S.-M. Choi, *11th International Conference on the Science and Application of Nanotubes (NT10), Jun. 27 - Jul. 2, 2010, Hilton Bonaventure, Montreal, Canada (poster)*

“Functionalized Single-Walled Carbon Nanotubes with Pluronic Polymer and Their Self-Assembled Phase Behavior.” H.-S. Jang, **C. Doe**, T.-H. Kim, S.-M. Choi, *The Polymer Society of Korea - 2010 Spring, Daejeon Convention Center, Daejeon, Korea, April 8-9, 2010 (poster)*

“Highly Ordered Self Assembly of 1D Nanoparticles in Soft Matter.” S.-M. Choi, **C. Doe**, T.-H. Kim, H.-S. Jang, J. Yu, J.-B. Sim, J. Kim, and S. R. Kline, *The 21st Synchrotron Radiation user's Workshop & KOSUA Meeting, POSCO, Pohang, Korea, November 20, 2009 (invited talk)*

“Pluronic ternary systems as potential templates for single wall carbon nanotube superstructures.” **C. Doe**, H.-S. Jang, S. R. Kline, and S.-M. Choi, *The Polymer Society of Korea - 2009 Spring, Daejeon, Korea, April 9-10, 2009 (poster)*

“Water-redispersible single wall carbon nanotubes for the development of self-assembled SWNT superstructures in polymeric systems.” C. Doe, T.-H. Kim, H.-S. Jang, S. R. Kline, and S.-M. Choi. *The 9th Japan-Korea Meeting on Neutron Science, Busan, Korea, February 9-10, 2009 (poster)*

“Monte Carlo Simulation for Small Angle Neutron and X-ray Scattering Intensities of Nanoparticles with Arbitrary Shape.” J.-H. Yoo\*, T.-H. Kim, C. Doe, and S.-M. Choi, *The 9th Japan-Korea Meeting on Neutron Science, Busan, Korea, February 9-10, 2009 (poster)*

“Water- and Organic Solvent-Redispersible Isolated Single Wall Carbon Nanotubes Fabricated by in-situ Polymerization of Micelles.” T.-H. Kim, C. Doe, S. R. Kline, and S.-M. Choi. *IUMRS-ICA2008, Nagoya, Japan, December 9-13, 2008 (poster)*

“Structure and Dynamics of Lipid Membranes Interacting with Peptides.” J.-H. Lee, C. Doe, S.-M. Choi, A. Faraone, P. A. Pincus, and S. R. Kline. *2008 International Workshop on Current Problems in Soft Condensed Matter, KAIST, Daejeon, South Korea, September 8-11, 2008 (poster)*

“Water-redispersible single wall carbon nanotubes for the development of self-assembled SWNT superstructures in polymeric systems.” C. Doe, T.H. Kim, H.S. Jang, S.R. Kline, and S.M. Choi. *The 6th workshop on X-ray and neutron scattering techniques for surface nano-characterization, Pohang, South Korea, Dec 11-12, 2008 (talk)*

“Self Assembly of Single Wall Carbon Nanotubes in Polymeric Systems.” C. Doe, H.S. Jang, S.R. Kline, and S.M. Choi. *International Workshop on Current Problems in Soft Condensed Matters, Daejeon, South Korea, Sep 8-11, 2008 (poster)*

“Monte Carlo Simulation of Small-Angle Neutron Scattering (SANS) Intensities for Nanoparticles with Arbitrary Shape.” J. Yoo, C. Doe, and S.M. Choi. *HANARO Symposium, Daejeon, South Korea, May 9, 2008 (poster)*

“Small Angle Neutron Scattering Study of Isolated Single Wall Carbon Nanotubes in Water.” C. Doe, T.H. Kim, S.M. Choi. *Korean Nuclear Society Meeting, Jeju, South Korea, May. 10-11, 2007 (talk)*

“Low Temperature Magnetic Phases of Ca<sub>3</sub>Co<sub>2</sub>O<sub>6</sub>.” C. Doe, S.M. Choi, K. Hong, S. Park, T.J. Sato, C.H. Kim, B. Kim, and B.G. Kim. *The 7th Japan-Korea Meeting on Neutron Science, Seoul, South Korea, Feb. 21-23, 2007 (Best Poster Award)*

“Low Temperature Magnetic Phases of Ca<sub>3</sub>Co<sub>2</sub>O<sub>6</sub>.” S. Park, K. Hong, C. Doe, S.M. Choi, T.J. Sato, C.H. Kim, B. Kim, and B.G. Kim. *Korean Physics Society Meeting, Daegu, South Korea, Oct. 19~20, 2006 (poster)*

“Adsorptions of CTVB on carbon nanotubes surfaces.” C. Doe, T.H. Kim, S.R. Kline, and S.M. Choi *ICNS (International Conference on Neutron Scattering), Sydney, Australia, Nov 27~Dec 2, 2005 (poster)*

“Neutron Spin Phase Study Using Spin-Echo Instrument at HANARO.” **C. Doe**, D.C. Woo, S.M. Choi, M.K. Moon, and C.H. Lee *Korean Physics Society Meeting, Suwon, South Korea, Apr 23~24, 2004* (poster)

“Efficiency Measurement of Spin Flippers Developed at HANARO.” **C. Doe**, H.S. Jang, S.M. Choi, M.K. Moon, C.H. Lee *HANARO 2005 (International Symposium on Research Reactor and Neutron Science), Daejeon, South Korea, Apr. 11~13, 2005* (poster)

“Development of Neutron Spin-Echo Instrument at HANARO.” **C. Doe**, D.C. Woo, S.M. Choi, M.K. Moon, C.H. Lee *The 4th Korea-Japan Meeting on Neutron Science, Tsukuba, Japan, Feb. 23~24, 2004* (poster)

### **Books & Chapters**

S.-M. Choi, **C. Doe**, and Y.S. Han, “Small Angle Neutron Scattering Studies of Soft Nanomaterials.” *Physics and High Technology*, **18**, 24-29, **2009**

S.-M. Choi, **C. Doe**, H.-S. Jang, T.-H. et al., *Annual Reports of Basic Atomic Energy Research Institute*, **2006-2009**

### **Patents**

"Single wall carbon nanotubes with surfactant-coated surface and process for preparing the same." Korea Patent No. 10-0874219, **Changwoo Do**, Tae-Hwan Kim, Sung-Min Choi. (2008)

"Fabrication of thermally switchable and ordered single wall carbon nanotube arrays using a polymeric system." Korea Patent App. No. 10-2010-0035496, **Changwoo Do**, Hyung-Sik Jang, Sung-Min Choi. (2008)