

Dr. Senbo Xiao

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Date of Birth: May 14, 1981 (Guangdong, China)

Education

- 11/2007- 7/2011 **Ph.D.**, Faculty of Biology, University of Heidelberg, Germany.
Doctoral research topic: protein materials mechanics.
- 9/2004 - 7/2007 **M.Sc.**, Department of Physics, Nankai University, China.
- 9/2000 - 7/2004 **B.Sc.**, Department of Physics, Nankai University, China.

Experience

- 1/2022 - present Associate professor, Dept. of Structural Engineering, NTNU, Norway.
- 3/2015 - 12/2020 Researcher, Dept. of Structural Engineering, NTNU, Norway.
- 6/2013 - 2/2015 Postdoc, Max Planck Institute for Polymer Research, Mainz, Germany.
- 8/2011 - 4/2013 Postdoc, Heidelberg Institute for Theoretical Studies, Heidelberg, Germany.
- 8/2007 - 7/2010 Research assistant (part-time), Shanghai Institute for Biological Science, Shanghai, China.
- 4/2005 - 6/2007 Super-computer system administrator (part-time), Nankai Institute of Scientific Computing, Tianjin, China.

Academic Overview

- Current research (2015–present), Dept. of Structural Engineering, NTNU. **Materials surface phobicity focusing on anti-icing and wetting phenomena, nanoenabled enhanced oil recovery, nanoscale thermal transport, carbon capture and storage, energy.**
- Postdoctoral Research (2013–2015), Max Planck Institute for Polymer Research. Polymer nanocomposite mechanics, theoretical materials mechanics and Coarse-grain modelling.
- Postdoctoral Research (2011–2013), HITS, Heidelberg. Molecular mechanics and bioinformatics studies on spider silk proteins (*in cooperation with Toyota*).
- Doctoral Research (2007–2011), Heidelberg University. Probing the mechanical determinants of protein materials using all-atom modelling and molecular dynamics simulations.

- Master degree research (2004–2007), Nankai University. Force-field parameterizing, molecular docking, molecular dynamics simulations, binding affinity calculation of drug compounds.

Teaching

- 2022 - present Eksperter i team - Nanomechanics (Master level, NTNU course code: TKT4854)
- 2015 - present Nanomechanics (PhD level, NTNU course code: TKT4146 and KT8307)
- 2010 short courses on scientific computing, molecular modelling and simulations (undergraduate and graduate levels) applied to materials mechanics.
- 2005 Modern Physics Experiments (lab instructor)
- 2004 Operating System (Linux) (practise course lecturer)

Supervision

- PhD 5 PhD students
- Master 2 master student

Project management

- 2021 - 2023 Manager (Norwegian side) of EEA Grant – Czech National Agency for International Education.
Project title: *"Sharing experience and knowledge in the field of multiscale modelling of materials"*
Project reference number: EHP-CZ-ICP-3-012

Organization of Scientific Meetings

- 2016 Biomolecular Simulations across Scale, Shanghai, China.
The symposium was funded by the Sino-German Centre for Promotion of Science, and had a focus of multiscale methodologies applied to macro-biomolecules. There were 53 speakers coming from China, Germany, Norway and the USA. I am one of the four organizers of the symposium.

Scientific Community Membership

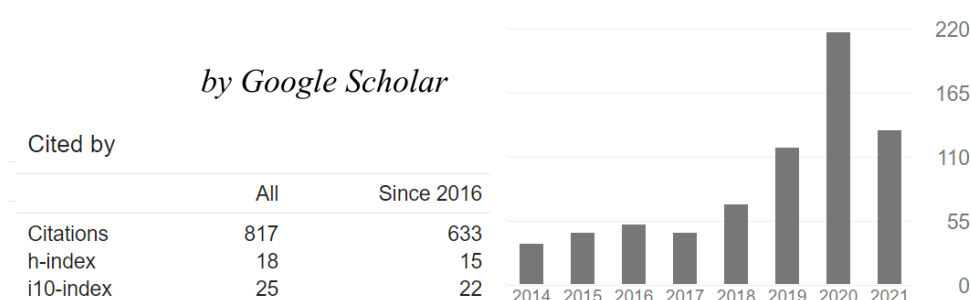
- 2019 - present International Association of Applied Mechanics (IAMM)
- 2020 - present Topic editor of the *Coatings Journal*
https://www.mdpi.com/journal/coatings/topic_editors

Invited Talks

- "Molecular Dynamics Simulations: From Atomistic Interactions to Zero-energy De-icing Technology", Innovation for Sustainability – Aker Solutions, December 2-5, 2019, Tranby, Norway

- "Zero-energy De-icing with Nanotechnology", Havets Hus – Dagens Næringsliv, October 22-24, 2019, Oslo, Norway
- "Nanoscale Ice Adhesion Mechanics", International Symposium on Materials for Anti-icing, May 27-28, 2019, Trondheim, Norway
- "Nanoscale De-icing by Molecular Dynamics simulations", 2016 IUTAM Symposium on Nanoscale Physical Mechanics, May 23-27, 2016, Nanjing, China
- "Nanoscale De-icing by Molecular Dynamics simulations", Sino-German Workshop on Biomolecular Simulations across Scales, May 26-31, 2016, Shanghai, China

Publications



- L Yan, Y Chang, **S Xiao**, A Raouf, CF Berg, J He. (2022) A quantitative study of salinity effect on water diffusion in n-alkane phases: From pore-scale experiments to molecular dynamic simulation. **Fuel** 324, 124716
- F Wang, **S Xiao**, J He, F Ning, R Ma, Z Zhang. (2022) Onion inspired hydrate-phobic surfaces. **Chemical Engineering Journal** 437,135274
- Y Chang, **S Xiao***, R Ma, Z Zhang, J He. (2022) Displacement dynamics of trapped oil in rough channels driven by nanofluids. **Fuel** 314, 122760
- Y Fu, **S Xiao***, BH Schallerund, Z Zhang, J He. (2022) Assembly of Graphene Platelets for Bioinspired, Stimuli-Responsive, Low Ice Adhesion Surfaces. **ACS omega** 7(12), 10225-10234
- Y Fu, **S Xiao***, S Liu, Y Chang, Z Zhang, J He. (2022) Atomistic Insights into the Droplet Size Evolution during Self-Microemulsification. **Langmuir** 30(10), 3129-3138
- Y Chang, **S Xiao***, R Ma, Z Zhang, J He. (2022) Atomistic insight into oil displacement on rough surface by Janus nanoparticles. **Energy** DOI:10.1016/j.energy.2022.123264
- F Wang, R Ma, **S Xiao***, NJ English, J He, Z Zhang. (2022) Anti-gas hydrate surfaces: perspectives, progress and prospects. **Journal of Materials Chemistry A** 10, 379-406
- Y Chang, **S Xiao***, R Ma, X Wang, Z Zhang, J He. (2021) Displacement dynamics of trapped oil in rough channels driven by nanofluids. **Fuel** DOI:10.1016/j.fuel.2021.122760

- R Ma, F Wang, Y Chang, **S Xiao***, NJ, English, J He, Z Zhang. (2021) Unraveling Adhesion Strength between Gas Hydrate and Solid Surfaces. **Langmuir** 37, 47, 13873–13881
- F Wang, Y Zhuo, Z He, **S Xiao***, J He, Z Zhang. (2021) Dynamic anti-icing surfaces (DAIS). **Advanced Science** DOI: 10.1002/advs.202101163
- Y Ding, H Yu, K Zhao, M Lin, **S Xiao**, M Ortiz, J He, Z Zhang. (2021) Hydrogen-induced transgranular to intergranular fracture transition in bi-crystalline nickel. **Scripta Materialia** DOI:10.1016/j.scriptamat.2021.114122
- Y Zhuo, Z Xia, Y Qi, T Sumigawa, J Wu, P Sestak, Y Lu, V Håkonsen, T Li, F Wang, W Chen, **S Xiao**, R Long, T Kitamura, L Li, J He, Z Zhang. (2021) Simultaneously toughening and stiffening elastomers with octuple hydrogen bonding. **Advanced Materials** DOI:10.1002/adma.202008523
- Y Chang, **S Xiao***, Y Fu, X Wang, Z Zhang, J He. (2021) Nanomechanical Characteristics of Trapped Oil Droplets with Nanoparticles: A Molecular Dynamics Simulation. **Journal of Petroleum Science and Engineering** DOI:10.1016/j.petrol.2021.108649
- Y Fu, J Wu, **S Xiao**, S Liu, Z Zhang, J He. (2021) Tensile Mechanical Characteristics of Thinnest Carbon Sulfur Nanothreads in Orientational Order. **Carbon** 184, 146-155
- Y Zhuo, J Chen, **S Xiao**, T Li, F Wang, J He, Z Zhang. (2021) Gels as emerging anti-icing materials: a mini review. **Materials Horizons** 2021, 8, 3266-3280
- S Ringdahl, **S Xiao***, J He, Z Zhang. (2021) Machine Learning Based Prediction of Nanoscale Ice Adhesion on Rough Surfaces. **Coatings** 11 (1), 33
- Y Fu, **S Xiao***, S Liu, J Wu, X Wang, L Qiao, Z Zhang, J He. (2020) Stability, deformation and rupture of Janus oligomer enabled self-emulsifying water-in-oil microemulsion droplet. **Physical Chemistry Chemical Physics** DOI:10.1039/D0CP03092A
- Y Zhuo, **S Xiao***, A Amirfazli, J He, Z Zhang (2020) Polysiloxane as icephobic materials – the past, present and the future. **Chemical Engineering Journal** DOI:10.1016/j.cej.2020.127088
- J Pan, **S Xiao**, Z Zhang; N Wei; J He; J Zhao. (2020) Nanoconfined Water Dynamics in Multilayer Graphene Nanopores. **Journal of Physical Chemistry C**. 124, 32, 17819–17828
- Y Zhuo[†], **S Xiao**[†], V Håkonsen, J He, Z Zhang (2020) Anti-icing Ionogel Surfaces: Inhibiting Ice Nucleation, Growth, and Adhesion. **ACS Materials Letters** DOI:10.1021/acsmaterialslett.0c00094
- S Rønneberg, **S Xiao**, J He, Z Zhang (2020) Nanoscale Correlations of Ice Adhesion Strength and Water Contact Angle. **Coatings** 10, 379
- F Wang, S Luo, **S Xiao**, W Zhang, Y Zhuo, J He, Z Zhang (2020) Enabling phase transition of infused lubricant in porous structure for exceptional oil/water separation. **Journal of Hazardous Materials** 390, 122176
- Y Zhuo, **S Xiao***, V Håkonsen, T Li, F Wang, J He, Z Zhang (2020) Ultrafast self-healing and highly transparent coating with mechanically durable icephobicity. **Applied Materials Today** DOI:10.1016/j.apmt.2019.100542

- **S Xiao***, B H Skallerud, F Wang, J He, Z Zhang (2019) Enabling Sequential Rupture for Lowering Atomistic Ice Adhesion. **Nanoscale** 11,16262-16269
- X Wang, **S Xiao**, Z Zhang, J He (2019) Transportation of Janus Nanoparticles in Confined Nanochannels: A Molecular Dynamics Simulations. **Environmental Science: Nano** DOI:10.1039/C9EN00314B
- F Wang, **S Xiao**, Y Zhuo, W Ding, J He, Z Zhang (2019) Liquid layer generator for excellent icephobicity at extremely low temperature. **Materials Horizons** DOI:10.1039/C9MH00859D
- Y Zhuo, T Li, F Wang, V Håkonsen, **S Xiao**, J He, Z Zhang (2019) Ultra-durable Icephobic Coating by Molecular pulley. **Soft Matter** DOI:10.1039/c9sm00162j
- J Wu, Å Ervik, I Snustad, **S Xiao**, A Brunsvold, J He, Z Zhang (2019) Contact Angle and Condensation of a CO₂ Droplet on a Solid Surface. **J Phys Chem C** vol. 123(1):443–451
- X Wang, **S Xiao**, Z Zhang, J He (2018) Displacement of Nanofluids in Silica Nanopores: Influenced by Wettability of Nanoparticles and Oil Components. **Environmental Science: Nano** DOI:10.1039/C8EN00704G
- J Wu, Q shi, Z Zhang, H Wu, C Wang, F Ning, **S Xiao**, J He, Z Zhang (2018) Nature-inspired Entwined Coiled Carbon Mechanical Metamaterials: Molecular Dynamics Simulations. **Nanoscale** vol. 10:15641-15653
- **S Xiao**, Z Zhang, J He (2018) Atomistic dewetting mechanics at wenzel and monostable cassie-baxter states. **Physical Chemistry, Chemical Physics - PCCP** vol. 20(38):24759-24767
- Y Zhuo, V Håkonsen, Z He, **S Xiao**, J He, Z Zhang (2018) Enhancing the mechanical durability of icephobic surfaces by introducing autonomous self-healing function. **ACS Applied Materials and Interfaces** vol. 10 (14)
- Y Zhuo, F Wang, **S Xiao**, Z Zhang, J He (2018) One-Step Fabrication of Bioinspired Lubricant-Regenerable Icephobic Slippery Liquid-Infused Porous Surfaces (SLIPS). **ACS Omega** Vol. 3(8)
- Z He, **S Xiao**, H Gao, J He, Z Zhang (2017) Multiscale Crack Initiators Promoted Super-Low Ice Adhesion Surfaces. **Soft Matter** Vol. 13(37)
- B Liu, C Wang, J Zhang, **S Xiao**, Z Zhang, Y Shen, B Sun, J He (2017) Displacement mechanism of oil in shale inorganic nanopores by supercritical carbon dioxide from molecular dynamics simulations. **Energy & Fuels** Vol. 31(1)
- W Mao, Y Gong, A Francesc, O Svoboda, N Nallesteros, S Torresm, M Clivia, **S Xiao**, Z Zhang, J He (2017) Raman Antenna Effect from Exciton-Phonon Coupling in Organic Semiconducting Nanobelts. **Nanoscale** Vol. 9(48)
- X Wang, **S Xiao**, Z Zhang, J He (2017) Effect of Nanoparticles on Spontaneous Imbibition of Water into Ultraconfined Reservoir Capillary by Molecular Dynamics Simulation. **Energies** Vol. 10(4)
- **S Xiao***, J He, Z Zhang (2017) Modeling nanoscale ice adhesion. **Acta mechanica solida Sinica** Vol. 30 (3): 224-226
- **S Xiao***, C Peter, K Kremer (2016) Systematic comparison of model polymer nanocomposite mechanics. **Bioinspir. Biomim.** Vol. 11 (5)

- **S Xiao**, J He, Z Zhang (2016) Nanoscale Deicing by Molecular Dynamics Simulation. **Nanoscale** 2016, 8, 14625 - 14632
- A Beckmann, **S Xiao**, J Müller, D Mercadante, T Nüchter, N Kröger, F Langhoyer, Wo Petrich, T Holstein, M Benoit, F Gräter, S Özbek (2015) A fast recoiling silk-like elastomer facilitates nanosecond nematocyst discharge. **BMC Biology** 13(1):3.
- **S Xiao**, F Gräter (2014) Molecular Basis of the Mechanical Hierarchy in Myomesin Dimers for Sarcomere Integrity. **Biophys J.** 107(4):965–973.
- S. P. Patil, **S Xiao**, K.Gkagkas, B. Markert, F Gräter (2014) Viscous Friction between Crystalline and Amorphous Phase of Dragline Silk. **PLoS ONE.** 9(8): e104832.
- **S Xiao**, S.J. Xiao, F Gräter (2013) Dissecting the structural determinants for the difference in mechanical stability of silk and amyloid β -sheet stacks. **Phys Chem Chem Phys.** 15:8765 - 8771
- **Senbo Xiao** (2011). Probing the Mechanics of Protein Materials with Molecular Dynamics Simulations. (*MAGNA CUM LAUDE*). **Heidelberg University.** (<http://www.ub.uni-heidelberg.de/archiv/12380>)
- F Berkemeier, M Bertz, **S Xiao**, N Pinotsis, M Wilmanns, F Gräter, M Rief (2011) Fast Folding α -Helices as Reversible Strain Absorbers in the Muscle Protein Myomesin. **Proc Natl Acad Sci USA.** 108(34):14139-44.
- M Cetinkaya, **S Xiao**, F Gräter (2011) Effects of crystalline subunit size on silk fiber. **Soft Matter** 7:8142 - 8148.
- M Cetinkaya, **S Xiao**, F Gräter (2011) Bottom-up computational modeling of semi-crystalline fibers: from atomistic to continuum scale. **Phys Chem Chem Phys.** 13(22):10426 - 10429
- M Cetinkaya, **S Xiao**, F Gräter (2011) Silk fiber mechanics from multiscale force distribution analysis. **Biophys J.** 100(5):1298-305.
- **S Xiao**, W Stacklies, C Debes, F Gräter (2010) Force distribution determines optimal length of β -sheet crystals for mechanical robustness. **Soft Matter**, 7:1308 - 1311.
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- **S. Xiao**, J. Chen, F. Gräter. (2009). Protein mechanics from simulations and X-Ray experiments. *Chinese Bulletin of Life Sciences.* **21(1):21-27**
- **S. Xiao**, W. Stacklies, M. Cetinkaya, B. Markert and F. Gräter. (2009) Mechanical Response of Silk Crystalline Units from Force Distribution Analysis. **Biophys J.** 96(10):3997-4005

† equal contribution. * corresponding communication.