

Wei Cao (曹玮)

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Personal Information

Birth Date: Feb. 27th, 1989

Birth Place: Henan, China

Education

- 9/2011-7/2016 **Tsinghua University**, China, Ph.D. in the Department of Chemistry
Advisor: Prof. Huaping Xu
- 4/2016-5/2016 **Stanford University**, USA, Visiting student in the Department of Chemistry
Advisor: Prof. Yan Xia
- 1/2015-4/2015 **Delft University of Technology**, the Netherlands, Visiting student
Advisor: Prof. Jan H. Van Esch
- 9/2007-7/2011 **Jilin University**, China, B. S. in the College of Chemistry
Advisor: Prof. Yue Wang

Professional Experience

- 1/2018- 9/2021 **Northwestern University**, USA, Postdoctoral scholar in Department of Chemistry
Advisor: Prof. Nathan C. Gianneschi
- 10/2016-12/2017 **UCLA**, USA, Postdoctoral scholar in Department of Chemistry and Biochemistry
Advisor: Prof. Ellen M. Sletten

Publications

1. Biomimetic Pheomelanin to Unravel the Electronic, Molecular and Supramolecular Structure of the Natural Product
W. Cao,* H. Mao, N. C. McCallum, X. Zhou, H. Sun, C. Sharpe, J. Korpany, Z. Hu, Q. Z. Ni, M. D. Burkart, M. D. Shawkey, M. R. Wasielewski, N. C. Gianneschi*
Chem. Sci., 2023, *14*, 4183-4192.
2. Unraveling the Structure and Function of Melanin through Synthesis
W. Cao,† X. Zhou,† N. C. McCallum, Z. Hu, Q. Z. Ni, U. Kapoor, C. Heil, K. S. Cay, T. Zand, A. J. Mantanona, A. Jayaraman, A. Dhinojwala, D. Deheyn, M. D. Shawkey, M. D. Burkart, J. D. Rinehart, N. C. Gianneschi* (†: Equal contribution)
J. Am. Chem. Soc. 2021, *143*, 2622–2637.
3. Selenomelanin: An Abiotic Selenium Analogue of Pheomelanin
W. Cao, N. C. McCallum, Q. Z. Ni, W. Li, H. Boyce, H. Mao, X. Zhou, H. Sun, M. P. Thompson, C. Battistella, M. R. Wasielewski, A. Dhinojwala, M. D. Shawkey,* M. D. Burkart*, Z. Wang,* N. C. Gianneschi*
J. Am. Chem. Soc. 2020, *142*, 12802-12810.
Highlighted by *C&EN* (2020, Volume 98, Issue 27); *EurekAlert!* (The American Association for the Advancement of Science, 2020), *Nano Today*, *Universe Today*, *Science Daily* etc.

4. Proapoptotic Peptide Brush Polymer Nanoparticles via Photoinitiated Polymerization-Induced Self-Assembly
H. Sun,† **W. Cao**,† N. Zang,† T. D. Clemons, G. M. Scheutz, Z. Hu, M. P. Thompson, Y. Liang, M. Vratsanos, X. Zhou, W. Choi, B. S. Sumerlin, S. I. Stupp, N. C. Gianneschi* (†: Equal contribution)
Angew. Chem. Int. Ed. 2020, 59, 19136-19142.
5. Fluorescent Cyanine Dye J-Aggregates in the Fluorous Phase
W. Cao, E. M. Sletten*
J. Am. Chem. Soc. 2018, 140, 2727-2730.
6. Tellurium-Containing Polymer Micelles: Competitive-Ligand-Regulated Coordination Responsive Systems
W. Cao, Y. W. Gu, M. Meineck, T. Y. Li, H. P. Xu*
J. Am. Chem. Soc. 2014, 136, 5132-5137.
7. γ -Ray-Responsive Supramolecular Hydrogel Based on a Diselenide-Containing Polymer and a Peptide
W. Cao, X. L. Zhang, X. M. Miao, Z. M. Yang*, H. P. Xu*
Angew. Chem., Int. Ed. 2013, 52, 6233-6237.
8. Selenium-Containing Polymers: Promising Biomaterials for Controlled Release and Enzyme Mimics
H. P. Xu*, **W. Cao**, X. Zhang*
Acc. Chem. Res. 2013, 46, 1647-1658. (**Highly Cited Paper**)
9. Coordination-Responsive Selenium-Containing Polymer Micelles for Controlled Drug Release
W. Cao, Y. Li, Y. Yi, S. B. Ji, L. W. Zeng, Z. W. Sun*, H. P. Xu*
Chem. Sci. 2012, 3, 3403-3408.
10. Selenium/Tellurium Containing Polymer Materials in Nanobiotechnology
W. Cao, L. Wang, H. P. Xu*
Nano Today, 2015, 10, 717-736.
11. Radical Enriched Artificial Melanin
W. Cao, A. J. Mantanona, H. Mao, N. C. McCallum, Y. Jiao, C. Battistella, V. Caponetti, N. Zang, M. P. Thompson, M. Montalti, J. F. Stoddart, M. R. Wasielewski, J. D. Rinehart*, N. C. Gianneschi *
Chem. Mater. 2020. 32, 5759–5767. Highlighted by *Chembites* (2020, Chembites).
12. Self-Assembly of Macromolecules within Single Topological Defects of Nematic Solvents
J. Noh,† **W. Cao**,† H. Sun, Y. Yang, N. C. Gianneschi*, N. L. Abbott* (†: Equal contribution)
Chem. Mater. 2020. 32, (15), 6753-6764.
13. Coordination Responsive Tellurium-Containing Multilayer Film for Controlled Delivery
W. Cao, L. Wang, H. P. Xu*
Chem. Commun. 2015, 51, 5520 -5522.

14. Ultra-Sensitive ROS-Responsive Tellurium-Containing Polymers
W. Cao, Y. W. Gu, T. Y. Li, H. P. Xu*
Chem. Commun. 2015, *51*, 7069-7071.
15. ROS-Triggered Degradation of Selenide-Containing Polymers Based on Selenoxide Elimination
L. Wang, K. X. Zhu, **W. Cao***, C. X. Sun, C. J. Lu, H. P. Xu*
Polym. Chem., 2019, *10*, 2039 – 2046.
16. Selenium-Containing Supra-Amphiphiles
W. Cao,* H. P. Xu*
Mater. Chem. Frontiers 2019, *3*, 2010-2017.
17. The Combination of Chemotherapy and Radiotherapy towards More Efficient Drug Delivery
W. Cao, Y. W. Gu, M. Meineck, H. P. Xu*
Chem. – Asian J. 2014, *9*, 48-57.
18. Tellurium-Containing Nanoparticles for Controlled Delivery of Cisplatin Based on Coordination Interaction
W. Cao, F. Li, R. F. Chen, H. P. Xu*
RSC Adv. 2016, *6*, 94033-94037.
19. Using Nanoscopic Solvent Defects for Spatial and Temporal Manipulation of Single Assemblies of Molecules
Soumik Das, JungHyun Noh, **Wei Cao**, Hao Sun, Nathan C. Gianneschi*, Nicholas Abbott*,
ACS Nano Lett., 2022, *22*, 18, 7506–7514
20. Anisotropic Synthetic Allomelanin Materials via Solid State Polymerization of Self-Assembled 1,8-Dihydroxynaphthalene Dimers
X. Zhou, X. Gong, **W. Cao**, Dr. C. J. Forman, Dr. J. Oktawiec, Dr. H. Sun, Dr. M. P. Thompson, Dr. Z. Hu, Dr. N. C. McCallum, Dr. C. D. Malliakas, O. K. Farha, N. C. Gianneschi*
Angew. Chemie. Int. Ed. 2021, *60*, 17464-17471.
21. Diselenide-Pemetrexed Assemblies for Combined Cancer Immuno-, Radio-, and Chemotherapies
T. Y. Li,† S. Pan,† S. Gao,* W. Xiang, C. Sun, **W. Cao**, H. P. Xu, * (†: Equal contribution)
Angew. Chem. Int. Ed. 2020, *59*, 2700-2704.
22. Degradable Polyphosphoramidate via Ring-Opening Metathesis Cryo-Polymerization
Y. Liang, H. Sun,* **W. Cao**, M. P. Thompson, N. C. Gianneschi*
ACS Macro Letter 2020, *9*, 1417-1422.
23. Bioactive Peptide Brush Polymers via Photoinduced Reversible-Deactivation Radical Polymerization
H. Sun,† W. Choi,† N. Z. Zang, C. Battistella, M. P. Thompson, **W. Cao**, X. H. Zhou, C. Forman, N. C. Gianneschi.* (†: Equal contribution)
Angew. Chem., Int. Ed. 2019, *58*, 17359–17364.
24. Artificial Allomelanin Nanoparticles

- X. Zhou,[†] N. McCallum,[†] Z. Hu, **W. Cao**, K. Gnanasekaran, Y. Feng, J. F. Stoddart, Z. Wang,*
N. C. Gianneschi.* ([†]: Equal contribution)
ACS Nano, 2019, 13, 10980-10990.
25. Recent Advances in Amphiphilic Polymer-Oligonucleotide Nanomaterials via Living/Controlled Polymerization Technologies
H. Sun, L. Yang, M. Thompson, S. Schara, **W. Cao**, W. Choi, Z. Hu, N. Zang, W. Tan,* N. Gianneschi*
Bioconjug. Chem. 2019, 30, 1889–1904.
26. UV-Responsive Cyclic Peptide Progelator Bioinks
A. S. Carlini, M. Touve, H. Fernández-Caro, M. P. Thompson, M. Cassidy, **W. Cao**, N. C. Gianneschi*
Faraday Discuss. 2019, 219, 44-57.
27. Near-Infrared Light Stimuli-Responsive Synergistic Therapy Nanoplatfoms Based on the Coordination of Tellurium-Containing Block Polymer and Cisplatin for Cancer Treatment
F. Li, T. Y. Li, **W. Cao**, J. H. Xia, H. P. Xu*
Biomaterials 2017, 133, 208-218.
28. Multi-Hierarchical Responsive Polymers: Stepwise Oxidation of a Selenium- and Tellurium-Containing Block Copolymer with Sensitivity to both Chemical and Electrochemical Stimuli
L. Wang, W. C. Wang, **W. Cao**, H. P. Xu*
Polym. Chem. 2017, 8, 4520-4527.
29. Tellurium-Containing Polymers: Towards Biomaterials and Optoelectronic Materials
L. Wang, **W. Cao**, H. P. Xu*
ChemNanoMat 2016, 2, 479-488.
30. Visible Light Induced Self-Healing Diselenide-Containing Polyurethane Elastomer
S. B. Ji, **W. Cao**, Y. Yu, H. P. Xu*
Adv. Mater. 2015, 27, 7740-7745.
31. Ultra-Sensitive ROS-Responsive Coassemblies of Tellurium-Containing Molecules and Phospholipids
L. Wang, F. Q. Fan, **W. Cao**, H. P. Xu*
ACS Appl. Mater. Interfaces 2015, 7, 16054-16060.
32. Dynamic Diselenide Bonds: Exchange Reaction Induced by Visible Light without Catalysis
S. B. Ji, **W. Cao**, Y. Yu, H. P. Xu*
Angew. Chem., Int. Ed. 2014, 53, 6781-6785.
33. Dual Redox Responsive Coassemblies Of Diselenide-Containing Block Copolymers and Polymer Lipids
L. Wang, **W. Cao**, Y. Yi, H. P. Xu*
Langmuir 2014, 30, 5628-5636.

34. Selenium–Platinum Coordination Compounds as Novel Anticancer Drugs: Selectively Killing Cancer Cells via a Reactive Oxygen Species (ROS)-Apoptosis Route
L. W. Zeng, Y. Li, T. Y. Li, **W. Cao**, Y. Yi, W. J. Geng, Z. W. Sun*, H. P. Xu*
Chem. Asian. J. 2014, 9, 2295-2302.
35. Switchable Catalytic Activity: Selenium-Containing Peptides with Redox-Controllable Self-Assembly Properties
X. M. Miao, **W. Cao**, W. Zheng, J. Wang, X. Zhang, J. Gao, C. Yang, D. Kong*, H. P. Xu*, L. Wang, Z. M. Yang*
Angew. Chem., Int. Ed. 2013, 52, 7781-7785.
36. Red Light Responsive Diselenide-Containing Block Copolymer Micelles.
P. Han, S. Li, **W. Cao**, Y. Li, Z. W. Sun, Z. Q. Wang, H. P. Xu*
J. Mater. Chem. B, 2013, 1, 740-743.
37. Visible-Light-Induced Disruption of Diselenide-Containing Layer-by-Layer Films: Toward Combination of Chemotherapy and Photodynamic Therapy
H. F. Ren, Y. T. Wu, Y. Li, **W. Cao**, Z. W. Sun*, H. P. Xu*, X. Zhang
Small 2013, 9, 3981-3986.
38. A New Dynamic Covalent Bond of Se-N: Towards Controlled Self-Assembly and Disassembly
Y. Yi, H. P. Xu*, L. Wang, **W. Cao**, X. Zhang*
Chem. -Eur. J. 2013, 19, 9506-9510.
39. A ROS Eliminating Nanocomposite Film Fabricated from Diselenide-Containing Polymer Micelles
S. B. Ji, **W. Cao**, H. P. Xu*
Part. Part. Syst. Char. 2013, 30, 1034-1038.
40. Fabrication of Well-Defined Crystalline Azacalixarene Nanosheets Assisted by Se ... N Non-Covalent Interactions
Y. Yi, S. Fa, **W. Cao**, L. W. Zeng, M. X. Wang, H. P. Xu*, X. Zhang*
Chem. Commun. 2012, 48, 7495-7497.

Book Chapters

41. Emerging Trends in Macromolecular Self-assembly. Chapter 10: Selenium-Containing Polymer Functional Self-Assemblies.
H. P. Xu, **W. Cao**, X. Zhang. Beijing: Ke xue chu ban she, 2018, pp 314-343.

Patents

1. Selenium-Containing Analogues of Pheomelanin and Related Materials and Methods of Making. Nathan C. Gianneschi, **Wei Cao**, **International Appl. No. PCT/US2020/05790**, filed [10-29-2020].
2. Methods and Materials for Matching Chemistry of Individuals and Human Melanin. Nathan C. Gianneschi, Zofia Elzbieta Siwicka, **Wei Cao**, US Provisional 63/357, 713, filed [07-01-2022].

Selected Honors and Awards

- American Chemical Society ACS-PMSE Future Faculty Scholar, 2021
- Outstanding Graduates of Beijing, 2016 (top 5%)
- Outstanding Graduates of Tsinghua University, 2016 (top 5%)
- Outstanding PhD Thesis of Tsinghua University, 2016
- Highest Award for Graduate Students of Tsinghua University, 2015 (top 10 among 26,000 graduate students of Tsinghua University are awarded each year)
- Gaoyingshi Scholarship, Tsinghua University, 2015
- Academic Rookie, Department of Chemistry, Tsinghua University, 2015
- Tsinghua Scholarship for Graduate Overseas Studies, 2014
- Shimadzu Scholarship, Department of Chemistry, Tsinghua University, 2014
- National Scholarship for Graduates, China, 2014 (top 5%)
- National Scholarship for Graduates, China, 2013 (top 5%)
- Shimadzu Scholarship, Department of Chemistry, Tsinghua University, 2013
- National Scholarship for Graduates, China, 2012 (top 5%)
- Outstanding Poster Presentation for the International Symposium on Polymer Chemistry, 2014 (top 5%)
- National College Students Chemistry Experiment Competition, 2nd prize, 2010
- National Endeavor Fellowship, Jilin University, 2010
- National Endeavor Fellowship, Jilin University, 2009
- Comprehensive First-Class Scholarship, Jilin University, 2008
- University Outstanding Students, Jilin University, 2008

Presentations

- 3/2022 ACS Spring, San Diego, USA.
Invited oral presentation: Selenium-containing biopolymers for combined chemo-radiotherapies and radiation protection
- 9/2021 National Annual Polymer Congress, Beijing, China.
Invited oral presentation: Selenium-Containing Biopolymers for Combined Chemo-Radiotherapies and Radiation Protection
- 8/2020 Main Group Zoom Symposium: From Molecules to Materials, USA.
Invited oral presentation: Selenium-Containing Biopolymers and their Radiation Related Applications.
- 11/2017 UCLA Glenn T. Seaborg Symposium, LA, USA. *Poster Presentation.*
- 12/2015 International Chemical Congress of Pacific Basin Societies, Honolulu, Hawaii, US. *Poster Presentation.*
- 6/2015 65th Lindau Nobel Laureate Meeting, Germany.
Selected as a speaker for Nobel Laureate Prof. Jean-Marie Lehn's master class on "Supramolecular and Adaptive Chemistry: From Materials Science to Medicine."
- 12/2014 MRS Fall Meeting, Boston, Massachusetts, USA.
Oral Presentation and Poster Presentation.
- 6/2013 5th International TRR 61 Symposium on Multilevel Self-assemblies, University of Münster, Germany. *Poster Presentation.*

Service

- 2021 Research mentor for an NSF Research Experience for Undergraduate (REU) students, Materials Research Science and Engineering Center, Northwestern University, USA
- 2020 Guest associate editor for a “Nanotechnology in Traditional Medicines and Natural Products” themed issue of *Frontiers in Chemistry*
- 2019 Research mentor for an NSF Research Experience for Undergraduate (REU) students, International Institute for Nanotechnology, Northwestern University, USA
- 2013-2014 Research mentor for High School YingCai Plan students, China
- 2016- now Reviewer for *ACS Biomater. Sci. Eng.*
- 2021- now Reviewer for *Biomacromolecules*, *ACS Appl Bio. Mater.*
- 2022- now Early career advisory board for *ACS Biomater. Sci. Eng*