Shi Shu (石澍)

Gender: Male **Date of Birth:** 1996-06-29

Phone: +65 81160387 | 18772365786 **Location:** Singapore/China

Email: shishu@u.nus.edu

Education

2020.01-2024.06 **National University of Singapore**
Materials Science & Engineering | PhD (GPA 5.00/5.00)

2019.01-2019.12 **National University of Singapore**
Materials Science & Engineering | Master (GPA 4.50/5.00)

2017.01-2018.12 **Monash University**
Materials Science & Engineering | Undergraduate (GPA 2.938/4.00)

2014.09-2016.07 **Wuhan University of Technology**
Materials Science & Engineering | Undergraduate (GPA 84.30/100.00)

Selected to join the "2+2" joint training program between Wuhan University of Technology and Monash University (2016), completing two years of study at Monash University and an undergraduate thesis; awarded dual bachelor's degrees in Materials Science and Engineering from both universities.

Experience

2024.03-present **Postdoctoral Research Fellow | National University of Singapore**
Research Interest: Ferroelectrics | Oxide thin films | Resistive Switching | Memristors | Neuromorphic Computing

Research

Research project 1: Interfacial engineering of ferroelectricity of HfO2-based thin films (2020.12-2023.03)

First author publication in Nature Communications (IF = 14.7)

Research project 2: Engineering of ferroelectricity of HZO thin films by charge transfer mechanism (2021.06-2024.07)

First author publication in Physical Review Letters (IF = 8.1)

Research project 3: Approaching Theoretical Polarization Limit in HfZrO2/HfLaO2 Multilayers (2022.03-2026.01)

First author publication in Nature Communications (IF = 14.7)

Research project 4: Highly linear memory synapses for high-precision neuromorphic computing (2022.12-2024.05)

Co-first author publication in Advanced Materials（IF = 27.4）

Research project 5：Spin-orbit torque induced controllable crystal inversion symmetry breaking (2022.09-2023.12)
Co-first author publication in Advanced Materials (IF = 27.4)

Research project 6：Highly energy-efficient spin current generation in SrIrO3 (2022.09-2023.12)
Co-first author publication in ACS Applied Materials & Interfaces (IF = 8.5)

Academic Service：Peer reviewer for

- Nature Communications
- Advanced Materials
- Journal of Alloys and Compounds
- Journal of Materials Chemistry C
- Advanced Materials Interfaces
- Advanced Science
- ACS Applied Electronic Materials

Skills

- Thin-film growth: pulsed laser deposition (PLD) for high-quality epitaxial single-crystalline films; magnetron sputtering.
- Characterization: SEM, AFM, HR-XRD (including φ-scan and reciprocal space mapping), PFM; MOKE, PPMS, VSM.
- Device fabrication: laser direct-write lithography; ion etching.
- Device testing: ferroelectric tester for thin-film ferroelectric characterization.

Awards

- National Self-funded Overseas Students Scholarship (China), 2023.
- NUS Research Scholarship, 2020–2024.
- NUS Enterprise Venture Initiation Programme (VIP) Award, 2024.
- 20th Chunhui Cup China Overseas Talents Innovation & Entrepreneurship Competition — Excellent Award, 2025.

Patents

- Chen, J., Zeng, T., Shi, S. A Memory Device and A Memory Array Thereof, SG patent, 10202303610R, granted.
- 石澍，郭盘林，一种基于掺杂氮化铝薄膜的耐高温非易失性存储单元及其制备方法及应用，202510450762X，filed.
- 石澍，郭盘林，一种基于耐高温相变型非易失性存储器件，202510469232X，filed.

Publications

[1] **Shi, S**., Xi, H., Su, H., Sawyer, F., Liu, Z., Niu, Zhang, Z., Yang, P., Zhu, Y., Yan, X., Tsymbal, E, Tian, H., Chen, J. (2026). Approaching theoretical polarization limit in HfZrO2/HfLaO2 multilayers. **Nature Communications**. DOI: 10.1038/s441467-026-69634-3.

[2] **Shi, S**., Xi, H., Cao, T., Lin, W., Liu, Z., Niu, J., Lan, D., Zhou, C., Cao, J., Su, H., Zhao, T., Yang, P., Zhu, Y., Yan, X., Tsymbal, E, Tian, H., Chen, J. (2024). Interface-engineered ferroelectricity of epitaxial $Hf_{0.5}Zr_{0.5}O_2$ thin films. **Nature Communications**, 14(1), 1780.

[3] **Shi, S**., Cao, T., Xi, H., Niu, J., Jing, X., Su, H., Yu, X., Yang, P., Wu, Y., Yan, X., Tian, H., Tsymbal, E., Chen, J. (2024). Stabilizing the ferroelectric phase of Hf0.5Zr0.5O2 thin films by charge transfer. **Physical Review Letters**, 133(3), 036202.

[4] Zeng, T.*, **Shi, S**.*, Jia, L.*, Li, B., Sun, K., Wu, Y., Su, H., Gu, Y., Li, H., Yan, X., Song, D., Chen, J. (2024). Linearity enhancement in crystalline-type memristor by controllable filament growth. **Advanced Materials**, 2401021.

[5] Liu, L., Zhou, C., Shu, X., Li, C., Zhao, T., Lin, W., Deng, J., Xie, Q., Chen, S., Zhou, J., Guo, R., Wang, H., Yu, J., **Shi, S**., Yang, P., Pennycook, S., Manchon, A., & Chen, J. (2021). Symmetry-dependent field-free switching of perpendicular magnetization. **Nature Nanotechnology**, 16(3), 277-282.

[6] Liu, L., Zhou, C., Zhao, T., Yao, B., Zhou, J., Shu, X., Chen, **S., Shi**, S., Xi, S., Lan, D., Lin, W., Xie, Q., Ren, L., Luo, Z., Sun, C., Yang, P., Guo, E., D ong, Z., Manchon, A., & Chen, J. (2022). Current-induced self-switching of perpendicular magnetization in CoPt single layer. **Nature Communications**, 13(1), 35-39.

[7] Zhang, Q.*, **Shi, S.***, Zheng, Z.*, Zhou, H., Shao, D., Zhao, T., Su, H., Liu, L., Shu, X., Jia, L., Gu, Y., Xiao, R., Wang, G., Zhao, C., Li, H., Chen, J. (2023). Highly energy-efficient spin current generation in SrIrO3 by manipulating the octahedral rotation. **ACS Applied Materials & Interfaces**,16(1), 1129-1136.

[8] Gao, J., Lian, X., Chen, Z., **Shi, S**., Li, E., Wang, Y., Jin, T., Chen, H., Liu, L., Chen, J., Zhu, Y., & Chen, W. (2022). Multifunctional $MoTe_2$ Fe-FET Enabled by Ferroelectric Polarization-Assisted Charge Trapping. **Advanced Functional Materials**, 32(17), 2110415.

[9] Zhao, Z., Abdelsamie, A., Guo, R., **Shi, S**., Zhao, J., Lin, W., Sun, K., Wang, J., Wang, J., Yan. X., Chen, J. Flexible artificial synapse based on single-crystalline BiFeO3 thin film. (2022). **Nano Research**, 15, 2682-2688.

[10] Zhou, J., Zhao, T., Shu, X., Liu, L., Lin, W., Chen, S., **Shi, S.**, Yan, X., Liu, X., Chen, J. (2021). Spin–Orbit Torque Induced Domain Nucleation for Neuromorphic Computing. **Advanced Materials**, 33(36), 2103672.

[11] Cao, J., **Shi, S.**, Zhu, Y., Chen, J. (2021). An Overview of Ferroelectric Hafnia and Epitaxial Growth. **physica status solidi (RRL)–Rapid Research Letters**, 15(5), 2100025.

[12] Yue, S., Cheng, H., He, H., Guan, X., Le, Q., Shu. X., Shi, S., Chen, J., Ouyang, J., (2021). Photo-enhanced Seeback effect of a highly conductive thermoelectric material. **Journal of Materials Chemistry A**, 9(31), 16725-16732.

[13] Yan, X., Jia, X., Zhang, Y., **Shi, S.**, Wang, L., Shao, Y., Sun, Y., Sun, S., Zhao, Z., Zhao, J., Sun, J., Guo, Z., Guan, Z., Zhang, Z., Han, X., Chen, J. (2023). A low-power Si: HfO2 ferroelectric tunnel memristor for spiking neural networks. **Nano Energy**, 107, 108091.

[14] Zheng, Z., Gu, Y., Zhang, Z., Zhang, X., Zhao, T., Li, H., Ren, L., Jia, L., Xiao, R., Zhou, H., Zhang, Q., **Shi, S**., Zhang, Y., Zhao, C., Shen, Lei., Zhao, W., Chen, J. (2023). Coexistence of Magnon-Induced and Rashba-Induced Unidirectional Magnetoresistance in Antiferromagnets. **Nano Letters**, 23(14), 6378–6385.

[15] Zheng, Z., Zeng, T., Zhao, T., **Shi, S.**, Ren, L., Zhang, T., Jia, L., Gu, Y., Xiao, R., Zhou, H., Zhang, Q., Lu, J., Wang, G., Zhao, C., Li, H., Tay, B., Chen, J. (2024). Effective electrical manipulation of a topological antiferromagnet by orbital torques. **Nature Communications**, 15(1), 745.

[16] Lan, D., Yao, B., Swamynadhan, M., Li, N., Cao, J., **Shi, S**., Yu, X., Yang, P., Wu, X., Liu, C., Chen, P., Chen, J., Ghosh, S., He, Q. Interfacial Electronic and Magnetic Reconstructions in Manganite/Titanate Superlattices. **Advanced Materials Interfaces**, 2300903.

[17] Gu, Y., Zheng, Z., Jia, L., **Shi, S.**, Zhao, T., Zeng, T., Zhang, Q., Zhu, Y., Wang, H., Chen, J. (2024). Ferroelectric Control of Spin-Orbitronics. **Advanced Functional Materials**, 2406444.

[18] Chen, H., Zhou, G., Ji, H., Qin, Q., **Shi, S**., Shen, Q., Yao, P., Cao, Y., Chen, J., Liu, Y., Wang, H., Lin, W., Yang, Y., Jia, J., Xu, X., Chen, J., Liu, L. (2024). Spin-Orbit Torque Switching of Magnetization in Ultra-Thick Ferromagnetic Layers. **Advanced Functional Materials**, 2403107.

[19] Jia, L., Zheng, Z., Zhang, X., Zhang, Q., Sim, S., Zhao, T., Gu, Y., Zeng, T., Xiao, R., **Shi, S**., Wu, J., Shen, L., Novoselov, K., Chen, J. (2024). Unidirectional magnetoresistance in the van der Waals antiferromagnet CrPS4. **Physical Review B**, 110(21), 214411.

[20] Guo, J., Wang, F., Duo, Z., Sun, Y., Song, J., Hou, Y., Dai, X., Zhao, W., Yan, S., Hu, X., Lou, J., Wang, Y., **Shi, S.**, Chen, J., Liu, B., Yan, X. (2024). Ultra-Thin Cubic Ti3Al Buffer/Template Layer Achieving Giant Polarization of Epitaxial Pb(Zr0.40Ti0.60)O3 Film. **Advanced Functional Materials**, 2415919.

[21] Zhao, T., Zheng, Z., Wang, J., Zhou, G., Liu, L., Zhou, C., Xie, Q., Jia, L., Xiao, R., Zhang, Q., Ren, L., Shi, S., Zeng, T., Gu, Y., Xu, X., Zhang, Y., Chen, J. (2025). Spin Logic enabled by current vector adder. Nature Communications, 2988.