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Curriculum Vitae

Education

Ph. D (2009.9 -- 2015.7)
Solid Atomic Imaging Division, Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, China
Dissertation: Atomic Scale Analysis of the Fine structures of Boride/Carbide Precipitated in Nickel-based Superalloys
Supervisor: Prof. Xiuliang Ma
Bachelor (2005.9 -- 2009.7)
Department of Materials Science and Engineering, Central South University, Changsha, China

Professional experience

Research Associate Professor and TEM Facility Manager at Northwestern University (2023.4 – present)
Research Assistant Professor and TEM Facility Manager at Northwestern University (2018.8 – 2023.3)
Supervisor: Prof. Vinayak P. Dravid

- Aberration corrected transmission electron microscopy, diffraction imaging, electron crystallography
- Development of novel medium heavy alloys (MHAs), new generation low-cost ultrahigh strength steels, novel oxide dispersion strengthened high entropy alloys (HEAs) and nano-sized HEAs thin films
- Advanced applications of TEM on engineering alloys, battery materials, thermoelectric materials, catalyst, novel inorganic compounds and hybrid inorganic–organic perovskite
- Dynamic behavior of materials under different stimuli and environments
- Development of novel microelectromechanical systems (MEMS) based chips for *in operando* TEM

Research Associate at Brookhaven National Laboratory (2016.12 -- 2018.7)
Supervisor: Dr. Yimei Zhu and Prof. Esther Takeuchi

- Atomic-scale analyses of the electrochemical behavior of the novel MnO_2-based cathode materials such as hollandite, birnessite and todorokite
- In-situ TEM characterization of novel MnO_2-based cathode materials

Postdoc Researcher at Japan Fine Ceramics Center (2015.8 -- 2016.11)
Supervisor: Prof. Yuichi Ikuhara

- Structure-property relationship of the traditional solid state electrolyte materials $La_{(1-x)/3}Li_xNbO_3$
- Atomic scale analysis of the pristine and charged/discharged all solid state Li-ion battery (epitaxially grown $LiMn_2O_4$ on single crystal $La_{(1-x)/3}Li_xNbO_3$)

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Skills

- Skillful in operating various kinds of advanced TEMs (FEI Titan^{3TM} G^2 Cubed 60-300 with monochromator, Tecnai G^2 F30/F20, Monochromated ARM 200F, Grand ARMs, JEOL 2100/2010UHR);
- Skillful in performing electron diffraction, diffraction contrast analysis, atomic resolution SEM/HAADF/LAADF/BF/ABF imaging, atomic resolution EDS/EELS mapping, EELS analysis, 4D-STEM, tomography and in situ heating/straining; Familiar with electron holography and differential phase contrast (DPC);
- Skillful in operating FIB (Hitachi, FB2100 FIB, NB5000 FIB-SEM);
- Skillful in using various kinds of *in situ* holders including *in situ* heating holder, *in situ* liquid N_2/He cooling holder, bias holder, electrochemical holder, liquid cell and cryo-TEM holder;
- Skillful in various kinds of diffractions/images/spectrums simulations, strain analyses (including reciprocal GPA, real space PPA), real space image and spectrum images drift correction, principal component analyses (PCA) and so on;
- Familiar with Matlab/Python coding;
- Familiar with cyclic voltammetry (CI), electrochemical impedance spectroscopy (EIS) and various kinds of mechanical properties characterization;

Publications *(*Corresponding author)*

Publication Journals (Only first-author or corresponding-author papers are counted):
***Acta Materialia* (6); *Journal of the American Chemical Society* (1); The Proceedings of the National Academy of Sciences (1); *Chemistry of Materials* (1); Nano Letters (2); *Scripta Materialia* (1)**; *Metallurgical and Materials Transaction A* (1); *Materials Science and Engineering A* (1); ACS Applied Materials & Interfaces (1); *Journal of Alloys and Compounds* (2); *Scientific Reports* (1); *Philosophical Magazine Letters* (4); *Ceramics International* (1);

1. Navoda Jayakodiarachchi, Rui Liu, Chamod Dharmadasa, **Xiaobing Hu**, Donald E. Savage, Cassandra L. Ward, Paul G. Evans, Charles H. Winter. Thermal atomic layer deposition of Er_2O_3 films from a volatile, thermally stable enaminolate precursor. ***Dalton Transactions*** 52 (2023) 11096-11103.
2. Kunmo Koo, Bo Shen, Sung-Il Baik, Zugang Mao, Paul J. M. Smeets, Ivan Cheuk, Kun He, Roberto dos Reis, Liliang Huang, Zihao Ye, **Xiaobing Hu***, Chad A. Mirkin*, Vinayak P. Dravid*. Formation mechanism of high-index faceted Pt-Bi alloy nanoparticles by evaporation induced growth from metal salts. ***Nature Communications*** 14 (2023) 3790. **(Selected as Editor's Highlights)**
3. Chunyi Huang, Didem Dede, Nicholas Morgan, Vaierio Piazza, **Xiaobing Hu**, Anna Foncuberta i Morral, Lincoln Lauhon. Trapping layers prevent dopant segregation and enable remote doping of templated self-assembled InGaAs nanowires. ***Nano Letters*** 23 (2023) 6284-6291.
4. Lin Wang, Yingnan Liu, Zhengfei Chen, Qizhou Dai, Chung-Li Dong, Bin Yang, Zhongjian Li, **Xiaobing Hu**, Lecheng Lei, Yang Hou. Theory-guided design of electron-deficient ruthenium cluster for ampere-level current density electrochemical hydrogen evolution. ***Nano Energy*** 115 (2023) 108694.
5. Dan Lin, Tingting Wang, Zilin Zhao, Yingnan Liu, Houhong Song, Xiaoxuan Yang, Zhongjian, Li, Siyu

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Yao, **Xiaobing Hu**, Lecheng Lei, Bin Yang, Yang Hou. Molten-salt-assisted synthesis of single-atom iron confined N-doped carbon nanosheets for highly efficient industrial-level CO_2 electroreduction and Zn-CO_2 batteries. ***Nano Energy*** 113 (2023) 108568.

6. Jian Jin, Joshua Wicks, Qiuhong Min, Jun Li, Yongfeng Hu, Jingyuan Ma, Yu Wang, Zheng Jiang, Yi Xu, Pengfei Ou, Xue Wang, Jiayang Song, Xiaohang Jiang, Yuanhao Lou, Dan Wu, Adnan Ozden, Ruihu Lu, Ziyun Wang, **Xiaobing Hu**, Vinayak Dravid, Yun Yiu, Tsun-Kong Sham, David Sinton, Yuanjie Pang, Panagiotis Papangelakis, Mohsen Shakouri, Qunfeng Xiao, Zhu Chen, Wei Zhang, Kesong Yu, Peng Qiu, Yu Mao, Chundong Wang, Bao Yu Xia, Liqiang Mai, Edward H Sargent, Yuanjie Pang. Constraining C_2 adsorbate orientations enables selective CO-to-acetate electroreduction. ***Nature*** 617 (2023) 724-729.
7. Shipeng Shu, Sungil Baik, Maryam Kazemzadeh-Atoufi, **Xiaobing Hu**, Tao Liu, Anyu Shang, Mark B. Davis, Robin Ziebarth, Sandeep Dhingra, Robert D. Morgan, Peter W. Voorhees, David N. Seidman. On the high-temperature oxidation of a niobium-bearing high nickel-chromium alloy: microstructural evolution and implications on oxidation mechanisms. ***Corrosion Science*** 220 (2023) 111261.
8. Yukun Liu, Hongyao Xie, Zhi Li, Yinying Zhang, Christos D Malliakas, Muath Al Malki, Stephanie Ribet, Shiqiang Hao, Thang Pham, Yuankang Wang, **Xiaobing Hu**, Roberto dos Reis, G. Jeffrey Snyder, Ctirad Uher, Christopher Wolverton, Mercouri G. Kanatzidis, Vinayak P. Dravid. Unraveling the role of entropy in thermoelectrics: entropy-stabilized quintuple rock salt $PbGeSnCd_xTe_{3+x}$. ***Journal of the American Chemical Society*** 145 (2023) 8677-8688.
9. Yue Li, **Xiaobing Hu**, Arash Fereidouni, Rabindra Basnet, Krishna Pandey, Jianguo Wen, Yuzi Liu, Hong Zheng, Hugh O. H. Churchill, Jin Hu, Amanda K. Petford-Long, Charudatta Phatak. Visualizing the effect of oxidation on magnetic domain behavior of Fe_3GeTe_2. ***ACS Applied Nano Materials*** 6 (2023) 4390-4397.
10. Bo Shen, Liliang Huang, Jiahong Shen, **Xiaobing Hu**, Peichen Zhong, Cindy Y. Zheng, Chris Wolverton, Chad A. Mirkin. Morphology engineering in multicomponent hollow metal chalcogenide nanoparticles. ***ACS Nano*** 17 (2023) 4642-4649.
11. Megan O. Hill, Paul Schmiedeke, Chunyi Huang, Siddharth Maddali, **Xiaobing Hu**, Stephan O. Hruszkewycz, Jonathan J. Finley, Gregor Koblmüller, Lincoln J. Lauhon. 3D Bragg coherent diffraction imaging of extended nanowires: defect formation in highly strained InGaAs quantum wells. ***ACS Nano*** 16 (2022), 20281-20293.
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13. Yuanwei Li, Wenjie Zhou, Ibrahim Tanriover, Wisnu Hadibrata, Benjamin E. Partridge, Haixin Lin, **Xiaobing Hu**, Byeongdu Lee, Jianfang Liu, Vinayak P. Dravid, Koray Aydin, Chad A. Mirkin. Open-channel metal particle superlattices. ***Nature*** 611 (2022), 695-701.
14. Xin Wang, Rafael Rodriguez De Vecchis, Chenyang Li, Hanlei Zhang, **Xiaobing Hu**, Soumya Sridar, Yuankang Wang, Wei Chen, Wei Xiong. Design metastability in high-entropy alloys by tailoring unstable fault energies. ***Science Advances*** 36 (2022) eabo7333.
15. Kunmo Koo, Stephanie M Ribet, Chi Zhang, Paul JM Smeets, Roberto Dos Reis, **Xiaobing Hu***, Vinayak P Dravid*. Effects of the encapsulation membrane in operando scanning transmission electron microscopy. ***Nano Letters*** 22 (2022) 4137–4144.

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16. Eric Schwenker, Venkata Surya Chaitanya Kolluru, Jinglong Guo, Rui Zhang, **Xiaobing Hu**, Qiucheng Li, Joshua T Paul, Mark C Hersam, Vinayak P Dravid, Robert Klie, Jeffrey R Guest, Maria KY Chan. Ingrained: An automated framework for fusing atomic-scale image simulations into experiments. ***Small*** 18 (2022) 2102960.
17. Xingyuan San, Mingyu Gong, Jian Wang*, Xiuliang Ma*, Roberto Dos Reis, Paul JM Smeets, Vinayak P Dravid*, **Xiaobing Hu***. Uncovering the crystal defects within aragonite $CaCO_3$. ***Proceedings of the National Academy of Sciences*** 119 (2022) e2122218119.
18. Haiyue Huang, Olivia Willilams Barber, Zhilong Yu, Hun Park, **Xiaobing Hu**, Xinqi Chen, Chun‐Hu Chen, Erica M Hartmann, Jiaxing Huang. Rub-resistant antibacterial surface conversion layer on stainless steel. ***Advanced Materials Interface*** 9 (2022) 2200251.
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24. Hualong Ge, Weiwei Xing, Bo Chen, **Xiaobing Hu**, Shijian Zheng, KuiLiu, Xiuliang Ma. A new refractory Ni_7Nb_2 phase identified in Laves eutectic regions by TEM study. ***Acta Materialia*** 214 (2021) 116985.
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26. Luke CO Prestowitz, Sahin Coskun, **Xiaobing Hu**, David C Dunand, Jiaxing Huang. Bulk nanostructured metal from multiply-twinned nanowires. ***Nano Letters*** 21 (2021) 5627-5632.
27. Shipeng Shu, **Xiaobing Hu**, Maryam Kazemzadeh-Atoufi, Tao Liu, Anyu Shang, Mark B Davis, Robin Ziebarth, Sandeep Dhingra, Robert D Morgan, Yao Du, Peter W Voorhees, David N Seidman. Formation mechanism and stability of austenitic islands in carbides in a Ni-Cr-Fe based high-temperature austenitic alloy undergoing carburization. ***Scripta Materialia*** 197 (2021) 113792.

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28. Boao Song, Yong Yang, Timothy T Yang, Kun He, **Xiaobing Hu**, Yifei Yuan, Vinayak P Dravid, Michael R Zachariah, Wissam A Saidi, Yuzi Liu, Reza Shahbazian-Yassar. Revealing high-temperature reduction dynamics of high-entropy alloy nanoparticles *via* in situ transmission electron microscopy. ***Nano Letters*** 21 (2021) 1742-1748.
29. Junhee Lee, Honghyuk Kim, Lakshay Gautam, Kun He, **Xiaobing Hu**, Vinayak P Dravid, Manijeh Razeghi. Study of phase transition in MOCVD Grown Ga_2O_3 from κ to β Phase by *ex situ* and *in situ* annealing. ***Photonics*** 8 (2021) 17.
30. Zihao Zhang, Siyu Yao, **Xiaobing Hu**, Francis Okejiri, Kun He, Pingying Liu, Ziqi Tian, Vinayak P Dravid, Jie Fu, Xiang Zhu, Sheng Dai. Sacrificial synthesis of supported Ru single atoms and clusters on N-doped carbon derived from covalent triazine frameworks: a charge modulation approach. ***Advanced Science*** 8 (2021) 2001493.
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34. Kun He, Michal Sawczyk, Cong Liu, Yifei Yuan, Boao Song, Ram Deivanayagam, Anmin Nie, **Xiaobing Hu**, Vinayak P Dravid, Jun Lu, Cortino Sukotjo, Yu-peng Lu, Petr Král, Tolou Shokuhfar, Reza Shahbazian-Yassar. Revealing nanoscale mineralization pathways of hydroxyapatite using in situ liquid cell transmission electron microscopy. ***Science Advances*** 6 (2020) eaaz7524.
35. Boao Song, Yong Yang, Muztoba Rabbani, Timothy T Yang, Kun He, **Xiaobing Hu**, Yifei Yuan, Pankaj Ghildiyal, Vinayak P Dravid, Michael R Zachariah, Wissam A Saidi, Yuzi Liu, Reza Shahbazian-Yassar. In situ oxidation studies of high-entropy alloy nanoparticles. ***ACS Nano*** 14 (2020) 15131-15143.
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39. Junqing Ye, James P Dombrowski, **Xiaobing Hu**, Javan Whitney-Warner, Shaohui Guo, Mayfair C Kung,

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Harold H Kung. Production of H_2O_2 during Au/C catalyzed aerobic oxidation of 1,2-propanediol. ***Applied Catalysis A: General*** 599 (2020) 117616.

40. Furui Zhang, **Xiaobing Hu**, Eric W Roth, Yonghwi Kim, SonBinh T Nguyen. Template-assisted, seed-mediated synthesis of hierarchically mesoporous core–shell UiO-66: enhancing adsorption capacity and catalytic activity through iterative growth. ***Chemistry of Materials*** 32 (2020) 4292-4302.
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42. Hao Chen, Siyu Yao, Wenwen Lin, Zihao Zhang, **Xiaobing Hu**, Xi Liu, Binhan Yan, Kequan Chen, Yong Qin, Yimei Zhu, Xiuyang Lu, Pingkai Ouyang, Jie Fu, Jingguang G. Chen. Highly efficient conversion of oleic acid to heptadecane without external hydrogen source over atomic layer deposited bimetallic NiPt catalysts. ***Chemical Engineering Journal*** 390 (2020) 124603.
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44. Y. Z. Liu*, **X. B. Hu***. Segregation and microstructural evolution at interfaces of atmospheric plasma sprayed thermal barrier coatings during thermal cycling. ***Journal of Alloys and Compounds*** 819 (2020) 153026.
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46. Zhi-Qiao Wang, Ming-Jian Zhang, **Xiao-Bing Hu**, Vinayak P. Dravid, Zhong-Ning Xu, Guo-Cong Guo. CeO_{2-x} quantum dots with massive oxygen vacancies as efficient catalyst for the synthesis of dimethyl carbonate. ***Chemical communications*** 56 (2020) 403-406.
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Patents

1. "Ultra-high Strength Steel with Balanced Strength and Toughness Achieved by Nanoscale β-NiAl and M_2C Precipitates and Forming Methods and Applications of Same," with **Xiaobing Hu**, Vinayak P. Dravid, Chunxu Wang, Shaozun Liu, and Yong Li, 2020 (***Pending***).
2. "Ni-W based Medium Heavy Alloy (MHA) with Excellent Static/Dynamic Properties and Impact Toughness and Forming Methods and Applications of Same," with **Xiaobing Hu**, Vinayak P. Dravid, Chunxu Wang, Shaozun Liu, and Yong Li, 2020 (***Pending***).
3. "Ultrathin Membrane Support and Related Methods," with Vinayak P. Dravid, **Xiaobing Hu**, Kunmo Koo, 2022 (***Pending***).

Research and facility equipment grants

1. "Development of the next generation low-cost ultrahigh strength steel facilitated by advanced high spatial resolution *ex-situ* and *in-situ* characterizations", BIAM-NU Seed Proposal (PI), $110,000, 2020.09-2021.09
2. "The Stela hybrid-pixel camera for multimode acquisition of electron scattering at low voltage", $368,300, Office of Research (PI), Northwestern University, 2021
3. " Upgrade of the Environmental Gas Cell System ", $70,516, Office of Research (PI), Northwestern University, 2023

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Representative honors & awards

1. **Outstanding Contribution in Reviewing** awarded by Materials Science and Engineering A, 2018
2. **Gold Star Award Certificate** by the Office for Research in Northwestern University, 2018
3. **Excellent Photo Award** granted by The Japan Institute of Metals and Materials Society, 2018
4. **National Scholarship** awarded by Chinese Ministry of Education, 2014
5. **Outstanding grade grants (GPA among Top 5)** awarded by Institute of Metal Research, 2010
6. **Lee Hsun Scholarship** awarded by Institute of Metal Research, 2008
7. **First Prize for mathematics competitions** in Hunan Province awarded by Mathematics Society of Hunan, 2008
8. **Pei-Yun Huang Education grants** awarded by Central South University, 2007

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Professional service

1. Served as materials sciences director of Midwest Microscopy and Microanalysis Society (M^3S) since 2023
2. Editor of Scientific Reports since 2022
3. Served on Proposal Review Panel (PRP) of Center for Nanoscale Materials (CNM) in Argonne National Lab (2021-2023)
4. Served on Proposal Review Panel (PRP) of Center for Functional Nanomaterials (CFN) in Brookhaven National Lab (2019-2021)
5. Served as Co-Chair of one symposium in Microscopy and Microanalyses Conference (2020), Milwaukee, Wisconsin
6. Refers to multiple funding agencies including NSF, DOE, Hong Kong Research Grants Council
7. Served as reviewers for many scientific journals including *Acta Materialia*, *Materials Science & Engineering A*, JOM, *Materials Characterization, Ceramics International*, *Microscopy and Microanalyses*, Journal of Alloys and Compounds, Carbon, *Nano Energy*, Journal of Physics and Chemistry, Carbon Energy, Journal of *Optics and Lasers in Engineering, and Scientific Reports, etc.*