

XINBO YANG

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I. EDUCATION AND TRAINING

University of Kentucky	Mining Engineering, Ph.D.	August 2019
Southern Illinois University Carbondale	Mining Engineering, M.S.	May 2015
China University of Mining & Technology	Mineral Processing Engineering, B.E.	June 2011

II. PROFESSIONAL EXPERIENCE

07/2022-present, Assistant Professor, Department of Material Science and Engineering, University of Utah.
01/2020-06/2022, Assistant Research Professor, Department of Mining Engineering, University of Kentucky.
01/2019-12/2019, Postdoc Research Fellow, Department of Mining Engineering, University of Kentucky.
08/2015-12/2018, Graduate Research Assistant, Department of Mining Engineering, University of Kentucky.
05/2012-06/2015, Graduate Research Assistant, Department of Mining Engineering, Southern Illinois University Carbondale

III. HONORS/AWARDS

- Rong Yu Wan Ph.D. Dissertation Award, Mineral Processing Division, Society for Mining, Metallurgy & Exploration (SME). (2020)
- Outstanding Graduate Student Award, Department of Mining, University of Kentucky. (2019)
- Richard Klimpel MPD Scholarship, Mineral Processing Division, Society for Mining, Metallurgy & Exploration (SME). (2017)
- WAAIME Scholarship, Society for Mining, Metallurgy & Exploration (SME). (2016-2018)
- 2012 P3 Student Competition Program, US Environmental Protection Agency (EPA). (2012)

IV. TEACHING

A. Courses

University of Utah

Semester	Title	Credits	Enrollments	Evaluation Score
Spring 2024	METE3610-Metallurgical Thermodynamics I	2.0	4	NA
Spring 2024	METE5670 – Mineral Processing I	3.0	6	NA
Fall 2023	METE/MSE7800 – Graduate Seminar	0.5	40	NA
Spring 2023	METE3610-Metallurgical Thermodynamics I	2.0	6	NA
Spring 2023	METE5670 – Mineral Processing I	3.0	8	NA

University of Kentucky

Semester	Title	Credits	Enrollments	Evaluation Score
Spring 2022	MNG580-Mineral Processing Plant Design	3.0	10	4.2 out of 5.0

Fall 2021	MNG575-Coal Preparation Plant Design	3.0	2	NA
Spring 2021	MNG580-Mineral Processing Plant Design	3.0	20	NA

B. Current Academic Advising Responsibilities

1. Wei Liu, Ph.D. Post-doctoral. (Supervisor)
2. Abdul Kaium Sayem, Ph.D student. Lithium battery recycling- graphite recovery, University of Utah (**Advisor**, Dissertation Committee Chair)
3. Emmanuel Yaw Owusu-Fordjour, Ph.D candidate. Bioleaching and carbon fixation, University of Utah (**Advisor**, Dissertation Committee Chair)
4. Srabani Karmakar, Ph.D. candidate. Electrophoretic Deposition of Silicon Nanoparticles, University of Utah (Dissertation Committee Member)
5. Jacob Yankey, Ph.D. candidate. Electrochemical measurement and corrosion studies of molten salt systems, University of Utah (Dissertation Committee Member)
6. Ahmad Nawab, Ph.D. An acid baking approach to enhance heavy rare earth element recovery from bituminous coal sources, University of Kentucky (Dissertation Committee Member)
7. Bin Ji, Ph.D. Correlations between the Mineralogy and Recovery Behavior of Rare Earth Elements (REEs) in Coal Waste, Virginia Tech (Dissertation Committee Member)

V. RESEARCH

A. Area of Expertise

Mineral processing, extractive metallurgy, leaching, precipitation, solvent extraction, solution chemistry, froth flotation, and surface chemistry.

B. Research Interests

- Rare earth element and critical material extraction and purification
- Integration of biotechnologies and chemical extraction for rare-earth extraction and separation.
- Mine waste management and environmental protection
- Strategic material sourcing, mining, and recycling

C. Research Grants Received

University of Utah – Personal credit: \$1,050,306

- Production of High-Grade Rare Earth Elements and Critical Materials from Coal Mine Drainage Aided by 3D Printed Ion Exchange Resin (07/01/2023-12/31/2024, Role: **PI**, U.S. Department of Interior Applied Science, \$200,000. Awarded.)
- Advanced Separation and Processing Technologies for Enhanced Product Recovery and Improved Water Utilization, Cost Reduction, and Environmental Impact of an Integrated Lithium-Ion Battery Recycling System (04/2023-03/2026, Role: **Co-PI**, Credit: 50%, Grant: American Battery Technology Company/U.S. Department of Energy, \$592,985)
- Development of a Carbon-Negative Process for Comminution Energy Reduction and Energy-Relevant Mineral Extraction through Carbon Mineralization and Biological Carbon Fixation (01/2023-12/2025, Role: **PI**, Credit: 80%, Grant: University of Kentucky /U.S. Department of Energy, \$480,004)

- Prevention of Acid Mine Drainage from its Source: Inhibition of Pyrite Oxidation using Humic Rich Food Waste Compost. (11/2022-06/2024, Role: **PI**, Grant FAIN: S23AC00049, U.S. Department of Interior Office of Surface Mining Reclamation and Enforcement, \$169,810)

University of Kentucky – Personal credit: \$1,974,000

- SynBREE: Synthetic Biology for Biomining of Rare Earth Elements. (06/2022-05/2026, Grant: Lawrence Livermore National Laboratory /U.S. Department of Defense, \$3,368,000)
- Prevention of Acid Mine Drainage from its Source: Inhibition of Pyrite Oxidation using Humic Rich Food Waste Compost. (01/2022-12/2023, Role: Principal Investigator, Grant: U.S. Department of Interior Office of Surface Mining Reclamation and Enforcement, \$200,000)
- Multi-Sourced Collaboration for the Production and Refining of Rare Earth and Critical Metals. (12/2021-08/2022, Role: Co-Principal Investigator, Grant: U.S. Department of Energy, \$150,000.)
- Consortium to Assess Northern Appalachia Resource Yield (Canary) of CORE-CM for Advanced Materials. (06/2021-06/2023, Role: Co-Principal Investigator, Grant: U.S. Department of Energy, \$70,000.)
- Demonstration of Scaled-Production of Rare Earth Oxides and Critical Materials from Coal-Based Sources Using Innovative, Low-Cost Process Technologies and Circuits. (07/2019-06/2022, Role: Co-Principal Investigator, Grant: U.S. Department of Energy, \$5,218,500.)
- Pilot-Scale Testing of an Integrated Circuit for the Extraction of Rare Earth Minerals and Elements from Coal and Coal Byproducts using Advanced Separation Technologies. (03/2016-09/2019, Role: Co-Principal Investigator, Grants: U.S. Department of Energy, \$7,334,599.)

VI. PUBLICATIONS

A. Peer-reviewed Journals

1. Liu, W., Sayem, A., Perez, J., Hornback, S., Owusu-Fordjour, E.Y., and Yang, X.*, 2024. Inhibition of Pyrite Oxidation using Food Waste Compost to Prevent the Formation of Acid Mine Drainage. Submitted to *Journal of Hazardous Materials*.
2. Nawab, A., Yang, X., and Honaker, R.Q., 2023. Parametric study of an acid baking process for rare earth element recovery from a bituminous-coal source. *International Journal of Coal Preparation and Utilization*, pp.1-25. <https://doi.org/10.1080/19392699.2023.2269094>.
3. Owusu-Fordjour, E.Y., Yang, X.* 2023. Bioleaching of rare earth elements challenges and opportunities: A critical review. *Journal of Environmental Chemical Engineering*, Vol 11 (5), 110413, <https://doi.org/10.1016/j.jece.2023.110413>.
4. Hasanizadeh, I., Khoshdast, H., Shojaei, V., Yang, X., Asgari, K. 2023. Flotation response of a bituminous coal sample in presence of a pyrolitic oil recycled from used car tires, *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 45:1, 1918-1936, <https://doi.org/10.1080/15567036.2023.2179696>
5. Lin, P., Werner, J., Groppo, J., and Yang, X. 2022. Material Characterization and Physical Processing of a General Type of Waste Printed Circuit Boards. *Sustainability*, 14(20), 13479. <https://doi.org/10.3390/su142013479>
6. Nawab, A., Yang, X., and Honaker, R.Q., 2022. An acid baking approach to enhance heavy rare earth recovery from bituminous coal-based sources. *Minerals Engineering*, 184, 107610. <https://doi.org/10.1016/j.mineng.2022.107610>

7. Nawab, A., Yang, X.*, and Honaker, R.Q., 2022. Parametric study and speciation analysis of rare earth precipitation using oxalic acid in a chloride solution system. *Minerals Engineering*, 176, 107352. <https://doi.org/10.1016/j.mineng.2021.107352>
8. Lin, P., Yang, X., Werner, J.M. and Honaker, R.Q., 2021. Application of Eh-pH Diagrams on Acid Leaching Systems for the Recovery of REEs from Bastnaesite, Monazite, and Xenotime. *Metals*, 11(5), p.734. <https://doi.org/10.3390/met11050734>
9. Yang, X. and Honaker, R.Q., 2020. Leaching Kinetics of Rare Earth Elements from Fire Clay Seam Coal. *Minerals*, 10(6), p.491. <https://doi.org/10.3390/min10060491>
10. Zhang, W., Noble, A., Yang, X., and Honaker, R.Q., 2020. A Comprehensive Review of Rare Earth Elements Recovery from Coal-Related Materials. *Minerals*, 10(5), p.451. <https://doi.org/10.3390/min10050451>
11. Zhang, W., Noble, A., Yang, X., and Honaker, R., 2020. Lithium leaching recovery and mechanisms from density fractions of an Illinois Basin bituminous coal. *Fuel*, 268(C). <https://doi.org/10.1016/j.fuel.2020.117319>
12. Huang, Q., Yang, X. and Honaker, R.Q., 2019. Evaluation of Frother Types for Improved Flotation Recovery and Selectivity. *Minerals*, 9(10), p.590. <https://doi.org/10.3390/min9100590>
13. Yang, X., Werner, J. and Honaker, R.Q., 2019. Leaching of rare Earth elements from an Illinois basin coal source. *Journal of Rare Earths*, 37(3), pp.312-321. <https://doi.org/10.1016/j.jre.2018.07.003>
14. Honaker, R.Q., Zhang, W., and Yang, X. "Conception of an integrated flowsheet for rare earth elements recovery from coal coarse refuse," *Minerals Engineering*. Vol. 122. 233-240, 2018. <https://doi.org/10.1016/j.mineng.2018.04.005>
15. Zhang, W., Yang, X., and Honaker, R.Q. "Association characteristic study and preliminary recovery investigation of rare earth elements from Fire Clay seam coal middlings." *Fuel*. 215. 551-560, 2018. <https://doi.org/10.1016/j.fuel.2017.11.075>

B. Peer-reviewed Conference Proceedings

1. Honaker, R., Werner, J., Yang, X., Chandra, A., Zhang, W., and Noble, A. 2020. Pilot Plant Evaluations of Rare Earth Element Recovery and Concentration Efforts from Pre-Combustion Bituminous Coal Sources. COM 2020: Toronto, Canada, August 24 – 27, 2020.
2. Honaker, R., Yang, X., Chandra A., Zhang, W., Werner, J. 2018. Hydrometallurgical Extraction of Rare Earth Elements from Coal: Proceedings of the First Global Conference on Extractive Metallurgy. Extraction 2018. January 2018. DOI: 10.1007/978-3-319-95022-8_193
3. Akbari, H., Heller, T., Shin, S., Yang, X., Kolay, P., Kumar, S., and Mohanty, M.K. "Geopolymer-based concrete to reduce carbon footprint of the construction industry," *Mining Engineering*, Vol. 65, No. 12, pp .57-62, 2013.

C. Technical reports

1. Honaker, R.Q., Werner, J., Nawab, A., Zhang, W., Noble, A., Free, M. and Yang, X., 2023. Demonstration of Scaled-Production of Rare Earth Oxides and Critical Materials from US Coal-Based Sources (No. DOE-UKY-31827). University of Kentucky Research Foundation. <https://doi.org/10.2172/1971736>.
2. Honaker, R., Werner, J., Yang, X., Zhang, W., Noble, A., Yoon, R.H., Luttrell, G., and Huang, Q. 2021. "Pilot-Scale Testing of an Integrated Circuit for the Extraction of Rare Earth Minerals and

Elements from Coal and Coal Byproducts Using Advanced Separation Technologies". United States. <https://www.osti.gov/servlets/purl/1798663>. (Report Number(s): DOE-UKY-0463, DOE Contract Number: FE0027035)

D. Abstracts, Presentations, and Posters

1. A. Nawab, R. Honaker, J. Werner, W. Zhang, A. Noble, M. Free and X. Yang, 2024. "Pilot Scale Demonstration of Rare Earth and Critical Element Recovery From Low-Grade Bituminous Coal Sources." 2024 SME Annual Conference. Phoenix, AZ, 2024. (abstract & presentation)
2. W. Liu, S. Hornback, and X. Yang. 2024. "Prevention of Acid Mine Drainage from Its Source: Inhibition of Pyrite Oxidation Using Humic-Rich Food Waste Compost." 2024 SME Annual Conference. Phoenix, AZ, 2024. (abstract & presentation)
3. Owusu-Fordjour, E.Y., Free, M., Burke, J., and Yang, X. 2024. "Bioleaching of Chalcopyrite and the Impact of Carbon Dioxide to Copper Extraction." 2024 SME Annual Conference. Phoenix, AZ, 2024. (abstract & presentation)
4. Owusu-Fordjour, E.Y., Yang, X. 2023. "A Review on Innovative Extraction of Rare Earth Elements From Primary and Secondary Resources Using Bioleaching Approach." 2023 SME Annual Conference. Denver, CO, 2023. (abstract & presentation)
5. Nawab, A., Yang, X., and Honaker, R.Q., 2023. "Parametric Study of an Acid Baking Process for Rare Earth Element Recovery From a Low-Grade Bituminous-Coal Source." 2023 SME Annual Conference. Denver, CO, 2023. (abstract & presentation)
6. Hornback, S., Yang, X., and Honaker, R., 2021. "Optimization of Pilot-Scale Solvent Extraction Unit for the Recovery of Scandium from "Bioacid"-Leached West KY Coarse Coal Refuse" AIChE Annual Conference, Boston, MA, 2021. (abstract & poster)
7. Yang, X., Zhang, W. and Honaker, R.Q., 2020. "Production of High Purity Rare Earth Oxide from Bituminous Coal-Based Sources using a Multi-Stage Selective Precipitate Circuit" 2020 SME Annual Conference. Phoenix, AZ, 2020. (abstract & presentation)
8. Yang, X. and Honaker, R.Q., 2020. "Leaching kinetics of Rare Earth Elements Associated with an Illinois No. 6 Coal" 2020 SME Annual Conference. Phoenix, AZ, 2020. (abstract & presentation)
9. Yang, X., Tang, H., Werner, J., and Honaker, R.Q., 2019. "Investigation into the recovery of rare earth elements from Dotiki coal plant coarse refuse by heap leaching" 2019 SME Annual Conference. Denver, CO, 2019. (abstract & presentation)
10. Yang, X. and Honaker, R.Q., 2018. "Leaching Kinetics of Rare Earth Elements from an Enriched Coal Source." 2018 SME Annual Conference. Minneapolis, MN, 2018. (abstract & presentation)
11. Yang X., Honaker, R.Q., and Han, K. "Hydrometallurgical Recovery of Rare Earth Elements from Coal Sources", 2017 SME Annual Conference, Denver, CO 2017. (abstract & presentation)
12. Yang, X., Huang, Q., and Honaker, R.Q., 2017. "Frother Evaluation for Improved Recovery and Selectivity in Column Flotation", 2017 SME Annual Conference, Denver, CO 2017. (abstract & presentation)
13. Yang, X., Mohanty, M.K., Luttrell, G.H., Bratton, B., McDaniel, B., and McDaniel, A. "Pilot-scale evaluation of an emerging drying technology for fine coal drying", 2014 SME Annual Conference, Salt Lake City, Utah, February 2014. (abstract & presentation)
14. Yang, X., Akbari, H. and Mohanty, M.K., 2013, "Climate change and carbon dioxide: A review", 2013 SME Annual Conference, Denver, Colorado, February 26. (abstract & presentation)

E. Patents

1. Honaker, R.Q., Yang, X., 2018. Low-Temperature Plasma Treatment for Enhanced Recovery of Highly Valued Critical Rare Earth Elements from Coal. (Application Serial No. 62/643,938.)

VII. SERVICES

A. University Services

1. Faculty liaison of the Department of Material Science for the university ACCESS program, University of Utah. (02/2023-present)
2. Department of Material Science ABET Committee, University of Utah. (10/2022-present)
3. College of Mines and Earth Sciences IT Committee, University of Utah. (08/2022-present)
4. Diversity and Inclusion Committee, College of Engineering, University of Kentucky. (2021-2022)

B. Professional Services

1. Professional Membership: Society for Mining, Metallurgy, and Exploration (SME), 2012-present.
2. Professional Membership: Women In Mining USA, 2022-present.
3. Guest editor: Minerals, Special issue "Surface Chemistry Aspect of Hydrometallurgical Processing for Metal Recovery from Ores"
4. Guest editor: Minerals, Special Issue "Recent Advances in Extractive Metallurgy"
5. Review Editor: Frontiers in Chemistry (IF 5.545)
6. Co-chair, MPD: Chemical Processing: Critical Metals I: Rare Earths. 2024 SME Annual Conference & Expo.
7. Chair, Chemical Processing: Innovative Extractive Processing for Rare Earth Materials, Mineral Processing Division, 2023 SME Annual Conference & Expo.
8. Co-chair & moderator, MPD: Chemical Processing: Challenges And Opportunity For Chemical Metallurgy In Clean Energy Economy: Panel, 2023 SME Annual Conference & Expo.
9. Judge, SME Mineral & Metallurgical Division (MPD) Student Poster Contest (2022).
10. Evaluation of manuscripts for journals: Minerals Engineering, Minerals, Energies, Applied Science, Metals, Mining, Metallurgy & Exploration, International Journal of Coal Preparation and Utilization, International Journal of Coal Science & Technology, Hydrometallurgy, Frontiers in Chemistry.
11. Evaluation of proposals for NSF and DOE.