University of Louisville
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Literature Seminar

When: November 10, 2022
Time: 2:30 p.m.
Location: CBLL-16

Single atom Nanozymes bioinspired by Natural enzymes

Abstract:

Nature often provides an inspiration for widespread applications in science and technology. For example, enzyme mimics can be employed for practical applications of reactions catalyzed by natural enzymes. Recently, single atom nanozymes have been promoted as enzyme mimics at an atomic level. Single atom nanozymes consist of single atomic site on a metal surface with unique features such as maximization of atomic utilization. Recently, several works have been reported on the enzymatic like activities of single atom nanozymes. However, many single atom nanozymes has been develop on trial-and-error manner without comprehensive understanding at the atomic level.[1] This seminar will be on various strategies for modulating the activities of single atom nanozymes for peroxidase-like reactivity. Zhu and coworkers worked on tunning the active site of the single iron atom site that showed peroxidase-like reactivity in a nitrogen-rich environment.[2] Li and coworkers engineering a related FeN_3P centered single atom nanozyme that also exhibited peroxidase-like activity comparable with natural peroxidase enzyme.[3] Wang and coworkers reported theoretical and experimental studies on a similar molybdenum single atom nanozyme with variable of nitrogen influencing reactivity.[4] The seminar will conclude with a comparison of these systems and challenges of these new artificial enzymes.

References:

1. Wang Y, Du R, Lee LYS, Wong KY. Rational design and structural engineering of heterogeneous single-atom nanozyme for biosensing. *J.Bios*. **2022**, 114-662.
2. Jiao, L., Wu, J., Zhong, H., Zhang, Y., Xu, W., Wu, Y., Chen, Y., Yan, H., Zhang, Q., Gu, W., Gu, L., Beckman, S.P., Huang, L., Zhu, C., 2020. Densely Isolated FeN_4 Sites for Peroxidase Mimicking. *ACS Catal.* **2020**, 10, 6422–6429.
3. Ji, S., Jiang, B., Hao, H. *et al.* Matching the kinetics of natural enzymes with a single-atom iron nanozyme. *Nat Catal.* **2021**, **4**, 407–417.
4. Wang, Y., Jia, G., Cui, X., Zhao, X., Zhang, Q., Gu, L., Zheng, L., Li, L.H., Wu, Q., Singh, D.J., Matsumura, D., Tsuji, T., Cui, Y.-T., Zhao, J., Zheng, W. Coordination Number Regulation of Molybdenum Single-Atom Nanozyme Peroxidase-like Specificity. *Chem.* **2021**, 7, 436–449.