

O-I-M Seminar Series

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February 2nd, 2024 • 3:00 pm, 110 WIL Hall

Hosted by Carl Brozek

Electron Hopping Through Metal-Organic Frameworks: Fundamental Insights and Applications



Owing to their large internal surface area, their porosity and synthetic tunability, metal-organic frameworks (MOFs) have become appealing research targets for a variety of applications, including energy storage, electrochromism, and catalysis. Amongst MOFs that are electrically conducting, those that propagate charge transport by a diffusional electron hopping mechanism are a rich research field, both from a fundamental as well as applied viewpoint.[1]

In this seminar, we will discuss a variety of MOFs that contain electronically isolated, redox active linkers, and determine factors that

govern charge transport, in particular, the coupling between electron and cation transport.[2] We will show that electric conductivity through redox conducting MOFs is strongly dependent on the redox composition of the MOF, and can be tuned by up to four orders of magnitude.[3] Applications of redox conducting MOFs within molecular catalysis of electrochemical reactions[4] and as electrochromic materials[5] will be demonstrated.

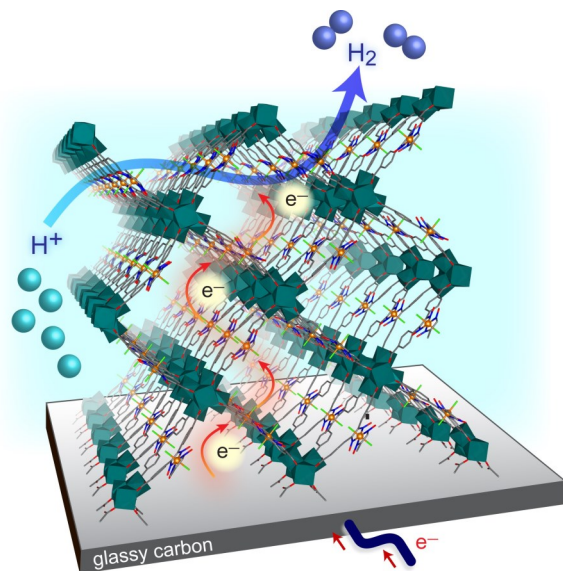


Figure. UU-100 MOF consisting of cobaloxime linkers for electrochemical HER

[1] B. A. Johnson, A. M. Beiler, B. D. McCarthy, S. Ott, J. Am. Chem. Soc. 2020, 142, 11941-11956.

[2] a) B. A. Johnson, A. Bhunia, H. Fei, S. M. Cohen, S. Ott, J. Am. Chem. Soc. 2018, 140, 2985-2994; b) A. T. Castner, B. A. Johnson, S. M. Cohen, S. Ott, J. Am. Chem. Soc. 2021, 143, 7991-7999; c) A. T. Castner, H. Su, E. Svensson Grape, A. K. Inge, B. A. Johnson, M. S. G. Ahlquist, S. Ott, J. Am. Chem. Soc. 2022, 144, 5910-5920.

[3] J. Li, A. Kumar, B. A. Johnson, S. Ott, Nature Commun. 2023, 14, 4388.

[4] S. Roy, Z. Huang, A. Bhunia, A. Castner, A. K. Gupta, X. Zou, S. Ott, J. Am. Chem. Soc. 2019, 141, 15942-15950.

[5] A. Kumar, J. Li, A. K. Inge, S. Ott, ACS Nano 2023, 17, 21595-21603.