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Mechanistic Insights into the redox properties of conjugated 2D-MOFs via electrochemical Raman Spectroscopy

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Abstract

Conjugated 2-dimensional Metal Organic Frameworks (MOFs) consisting of Phthalocyanine (Pc) monomers have shown to be great catalysts for the oxygen reduction reaction (ORR). [1]In the present work CuPc MOFs linked by Cu-O were synthesized on a water air interface, which resulted in a perpendicular orientation of the MOF in respect to the water surface. The CuPc-CuO_4 MOFs were subsequently attached to roughened silver electrodes through Langmuir Blodgett technique. Electrochemical Surface enhanced Raman spectroscopy (EC-Raman) [2], assisted by DFT simulations gave important information on the redox potentials of the CuPc in the monomer, MOF and the copper in the O-nodes. Additionally, for a more organized attachment of the MOFs onto graphite electrodes, the electrodes were modified with self -assembled monolayers of Copper and Nickel Nitrilotriacetic acid [3] before the attachment of the MOFs. This is shown to give better Raman signals and improved ORR activity.

References

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[2] Khoa H. Ly, Inez M. Weidinger, *Chem. Commun*., 57(2021) 2328-2342

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Figures

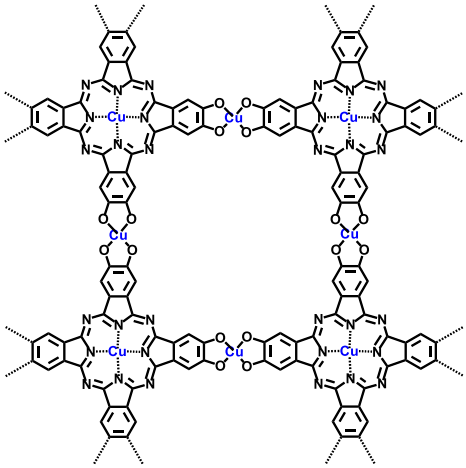

Figure 1: Chemical structure of $CuPcCuO_4$ MOF

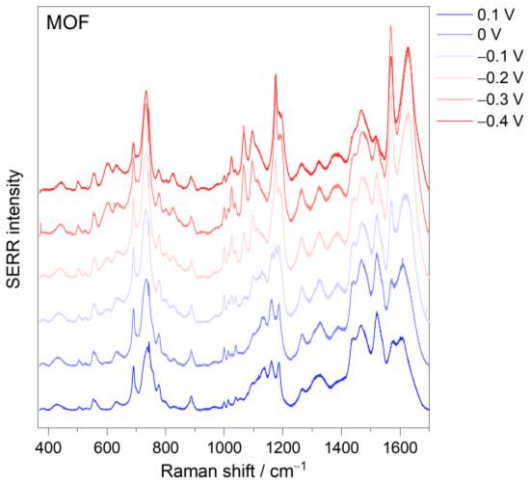

Figure 2: Surface enhanced Resonance Raman Spectrum of $CuPcCuO_4$ with varied potential