



Cu-Metal Organic Framework derived Multilevel Hierarchy as a Bifunctional Electrode for High-performance Supercapacitors and Oxygen Evolution Reaction

Zahir Abbas^a and Dr. Shaikh M. Mobin^{a*}

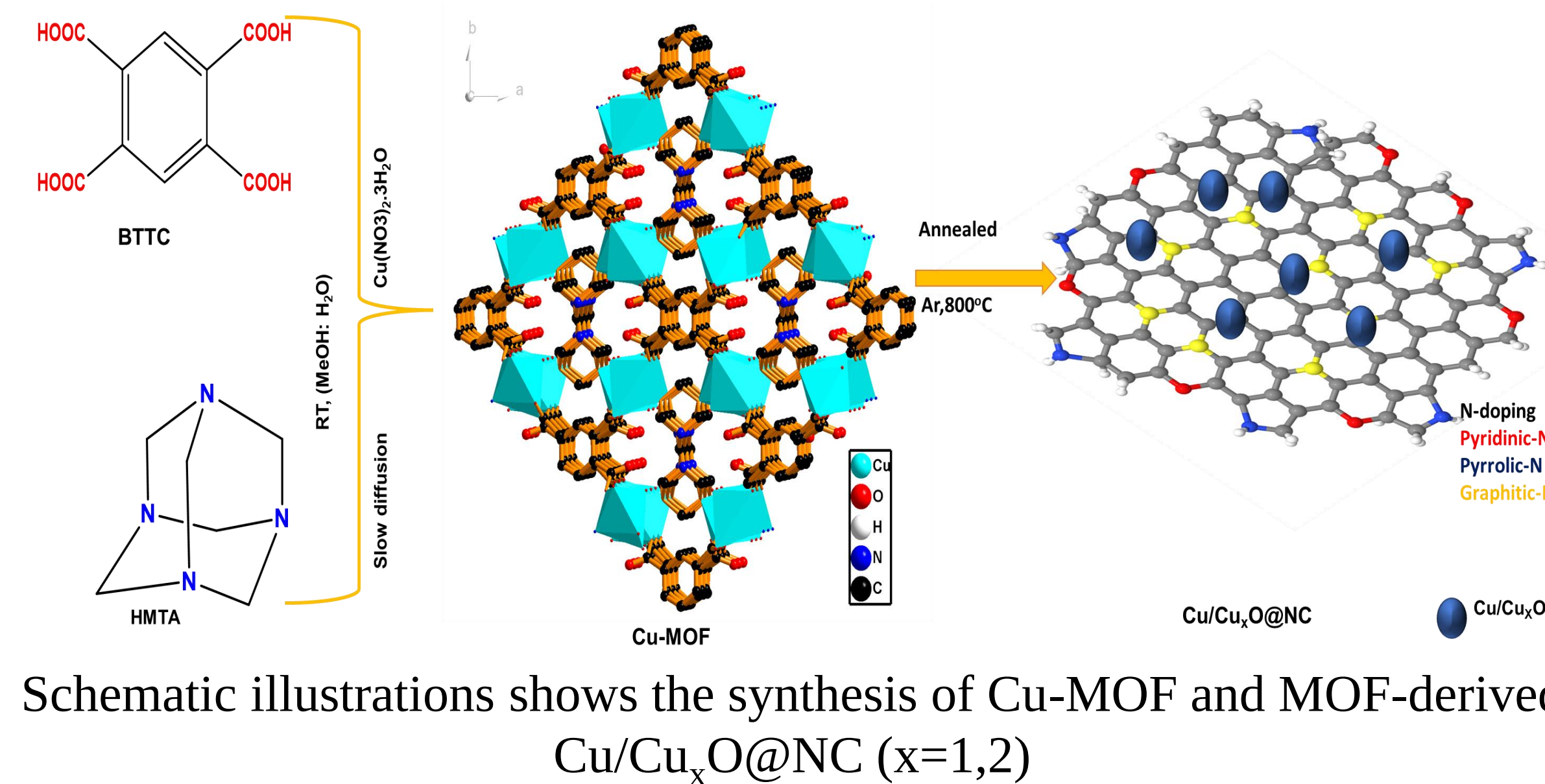
^aDepartment of Chemistry, Indian Institute of Technology Indore, Indore 453552, India

Email id xray@iiti.ac.in*, phd2001131017@iiti.ac.in

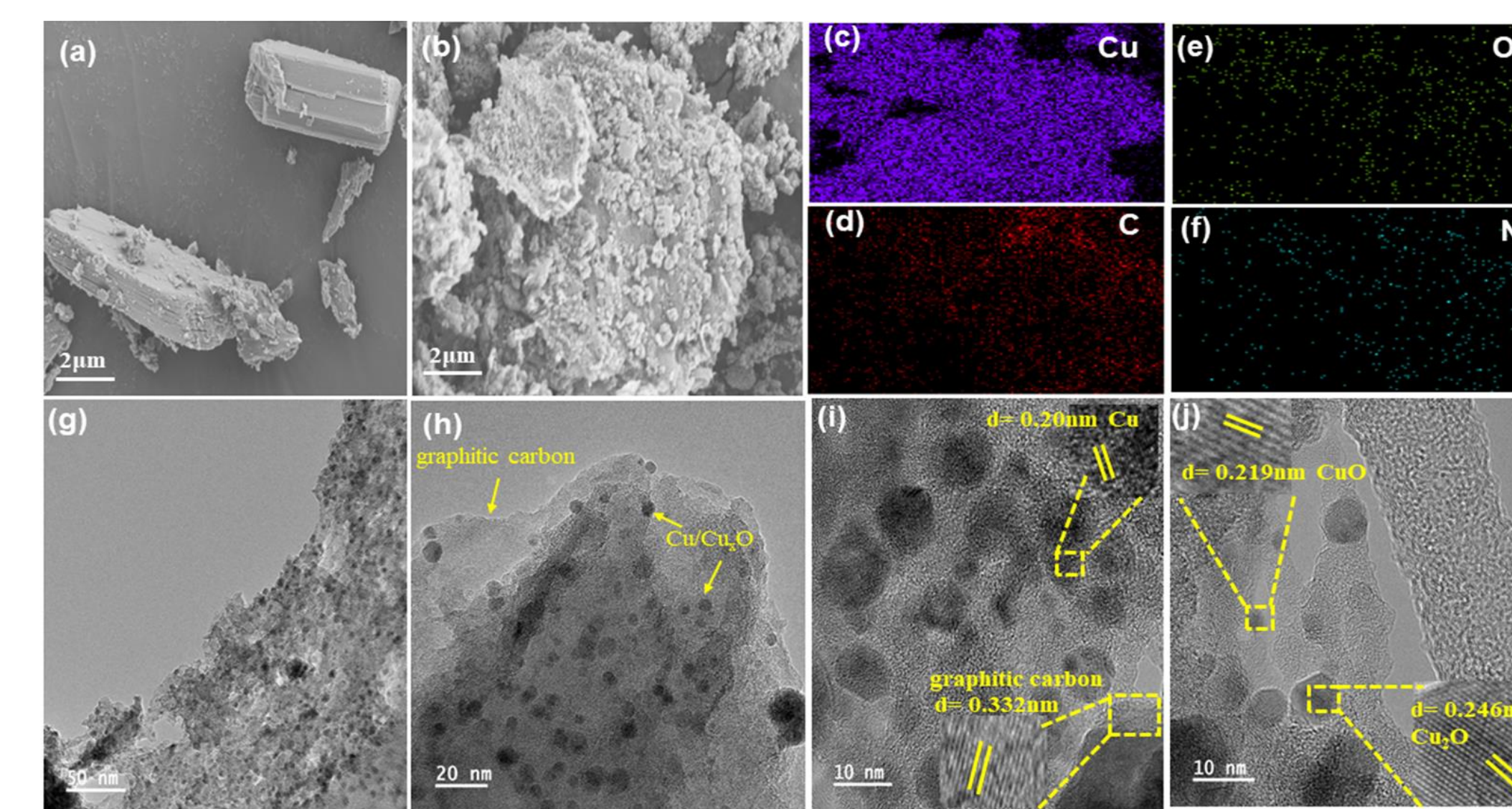
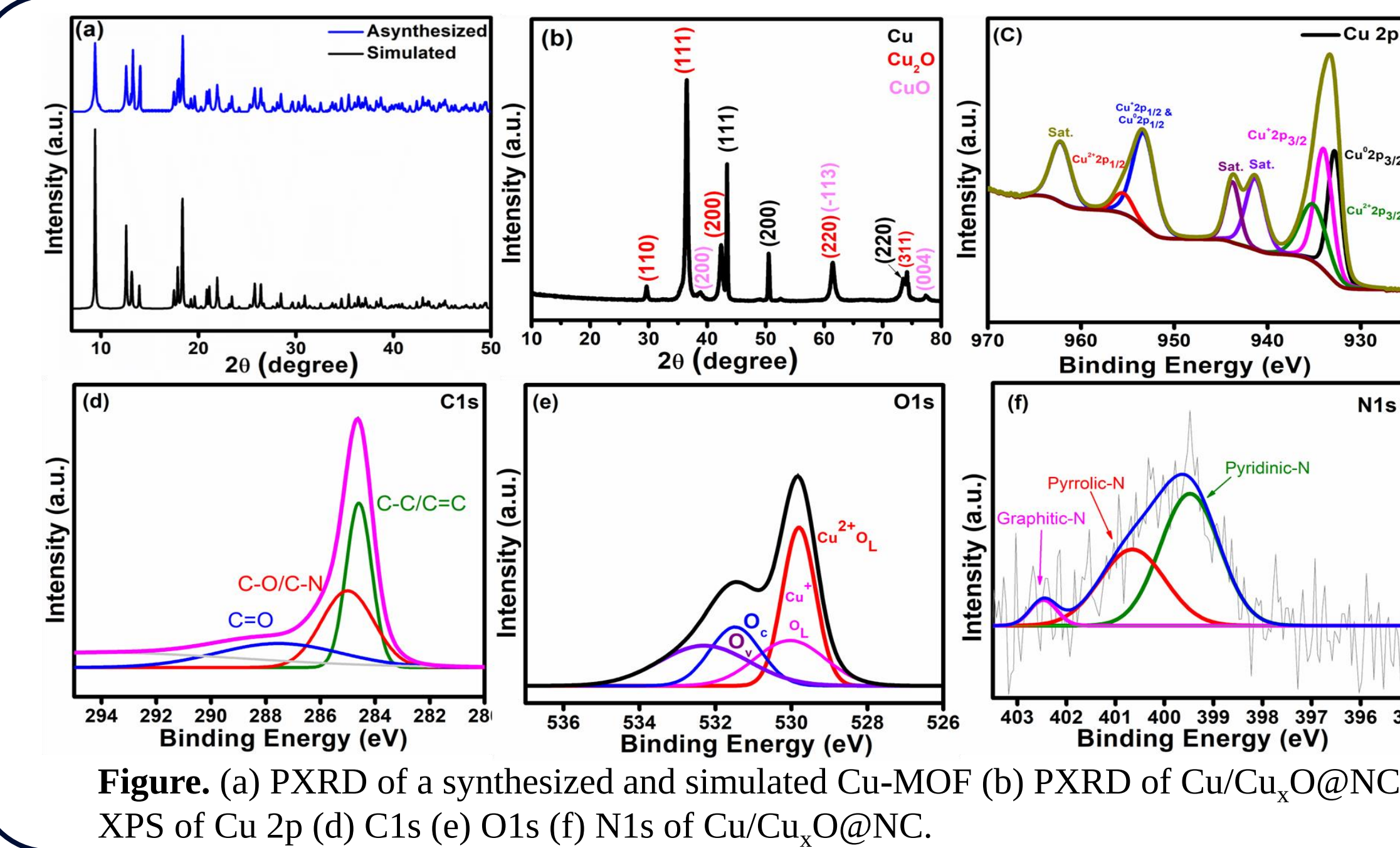
Abstract and Introduction

- Cu-MOF was synthesized via a slow diffusion method at ambient temperature and further utilized it as a precursor source for MOF-derived Cu/Cu_xO@NC (x = 1 and 2).
- The synthesized multilevel hierarchy was utilized as an electro-active material in a supercapacitor that achieved a specific capacitance of 546.6 Fg⁻¹ at 1 Ag⁻¹ with higher cyclic retention of 91.81% after 10,000 cycles.
- Furthermore, the ASC device was fabricated and utilized to enlighten the commercially available LED bulb.
- The electrode material was also explored for oxygen evolution reaction (OER) in an alkaline medium with a low overpotential of 170 mV along with a Tafel slope of 95 mVdec⁻¹ having long-term stability.

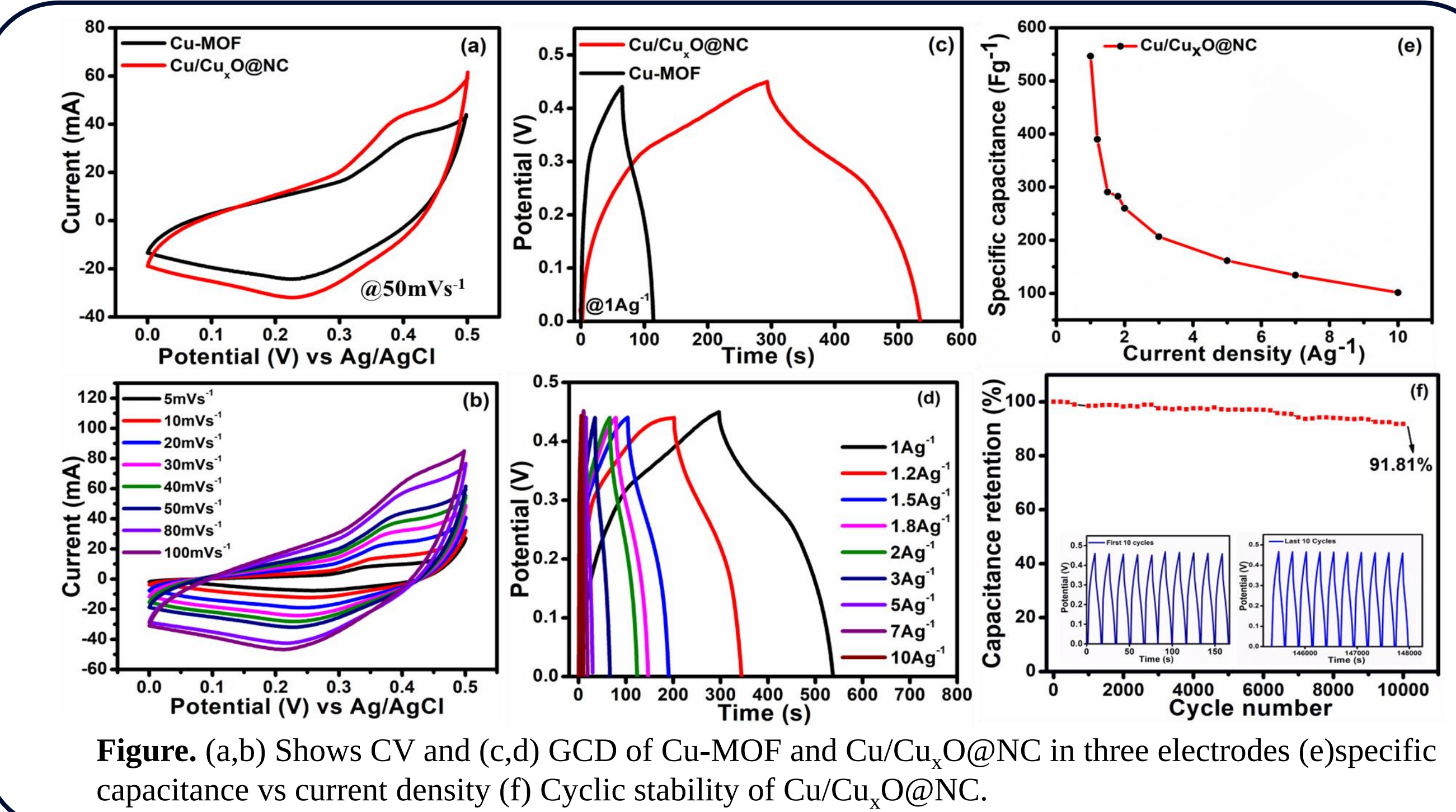
Experimental Procedure



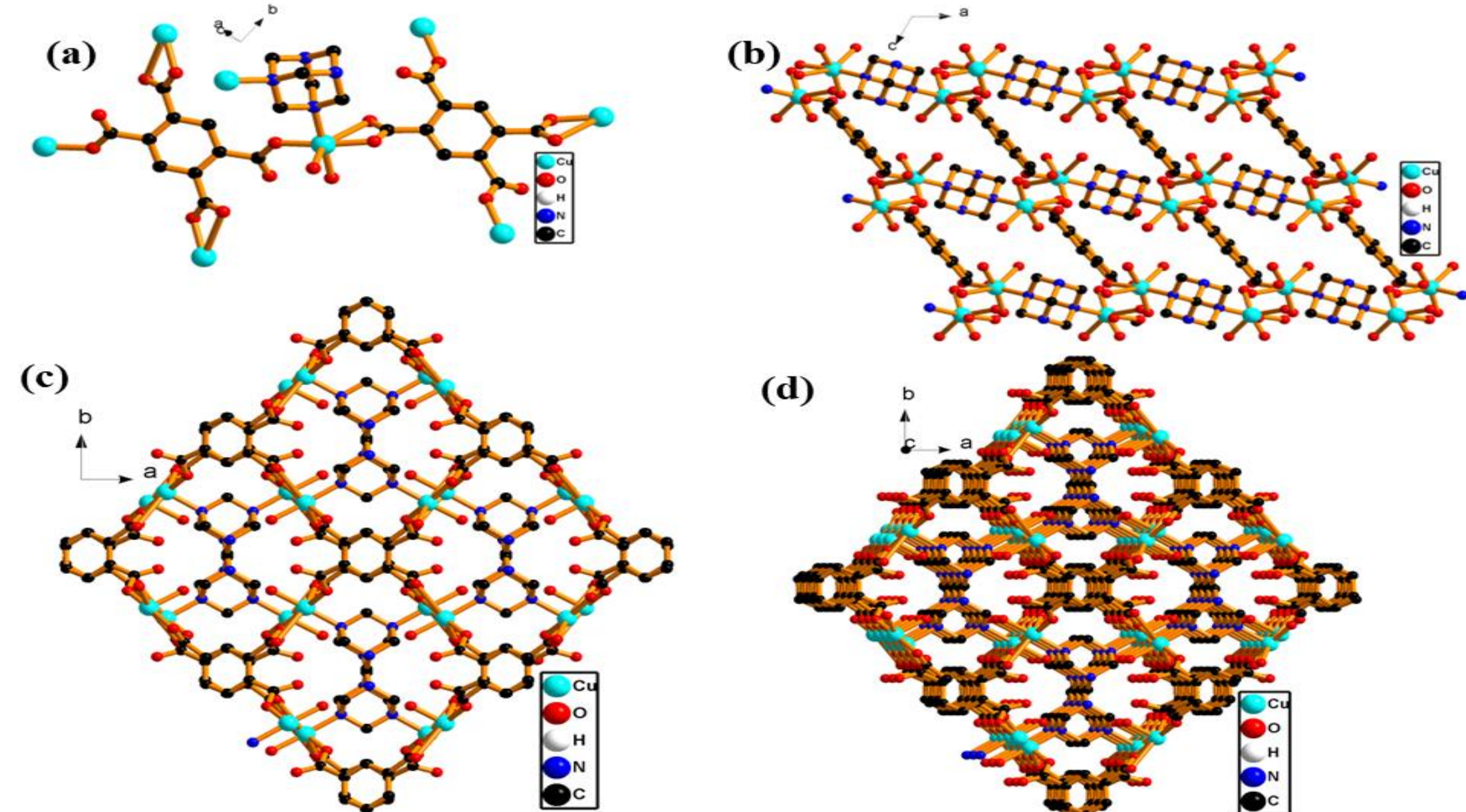
Characterizations



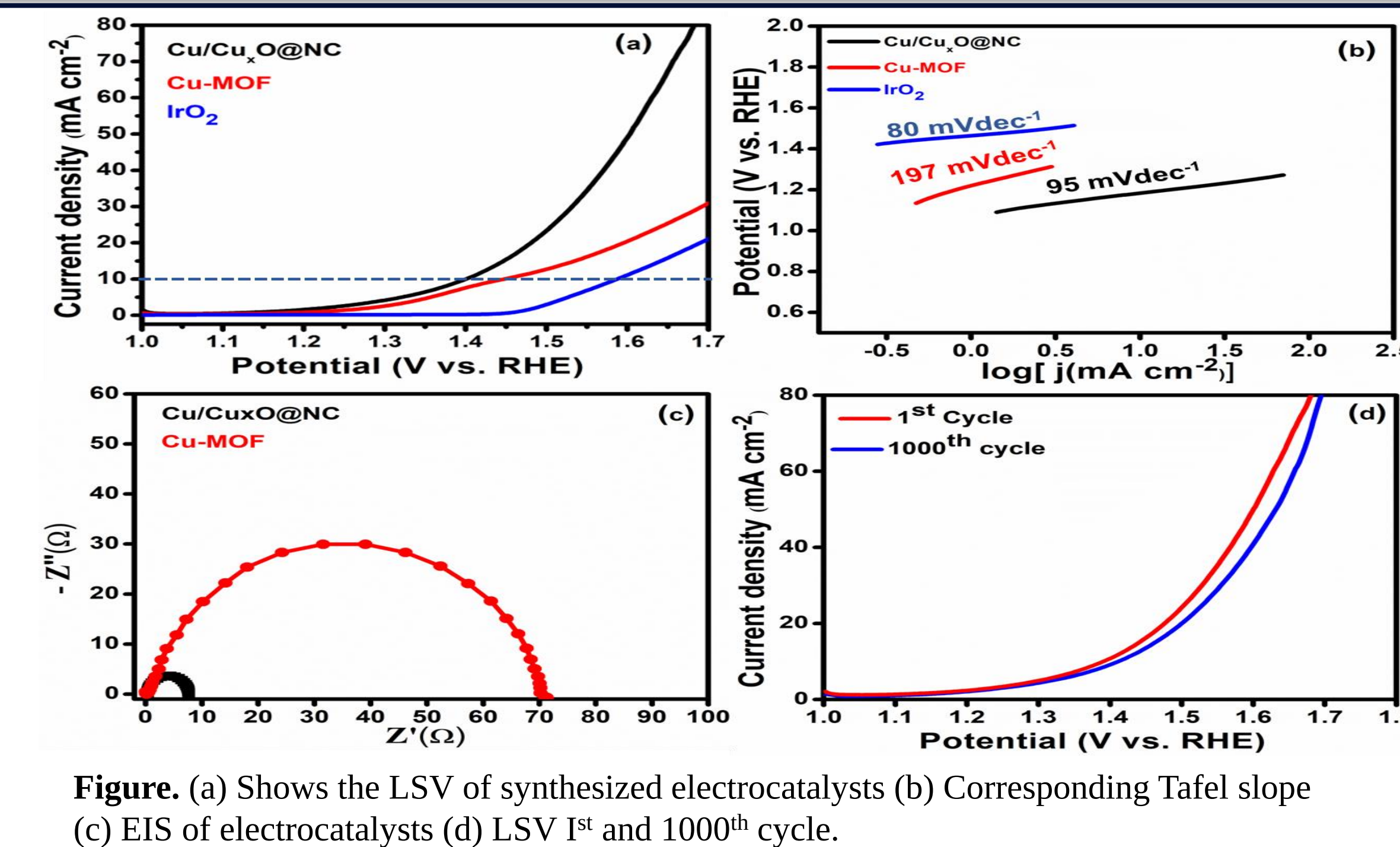
Supercapacitor Performance



Crystal Structure of Cu-MOF



OER Performance



Conclusions

- In summary, we have first synthesized a novel Cu-MOF in a facile manner followed by annealing for 4h to synthesize MOF-derived multilevel hierarchy Cu/Cu_xO@N-doped carbon matrix in a single-step with hexamine ligand served as N source.
- The obtained electro-active materials utilized as bifunctional electrodes in supercapacitors and OER have higher cyclic stability, Low over potential, and Low Tafel slope respectively.
- Thus, our synthesized one-step multilevel hierarchy is successfully utilized as a bifunctional electrode in energy storage and energy conversion system. We further believe that desired MOF derived structure can be explored for multifunctional applications.

References

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- Ruqiang Zou et al. *ACS Energy Lett.* 2020, 5, 2, 520–532
- X. Lou et al. *Nano Lett.* 2021, 21, 4, 1555–1565

Acknowledgement

