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Copper-molybdenum sulfide and phosphide electrodes for superior energy storage and conversion

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Introduction

- Due to the energy needs and environmental concerns, there is an increasing need for research into developing new materials that may be used in energy storage and production.
- Supercapacitor devices are a promising energy storage devices with high-power density and long cycle life.
- Electrocatalysts can help to improve the efficiency of water splitting reaction.
- Nanomaterials derived from ternary transition metal sulfides and phosphide have shown excellent potential for supercapacitor and water-splitting electrocatalysis applications.
- Our research synthesized the copper-molybdenum sulfide and phosphide via one-step hydrothermal and successive hydrothermal and phosphidation strategies.

Experiment

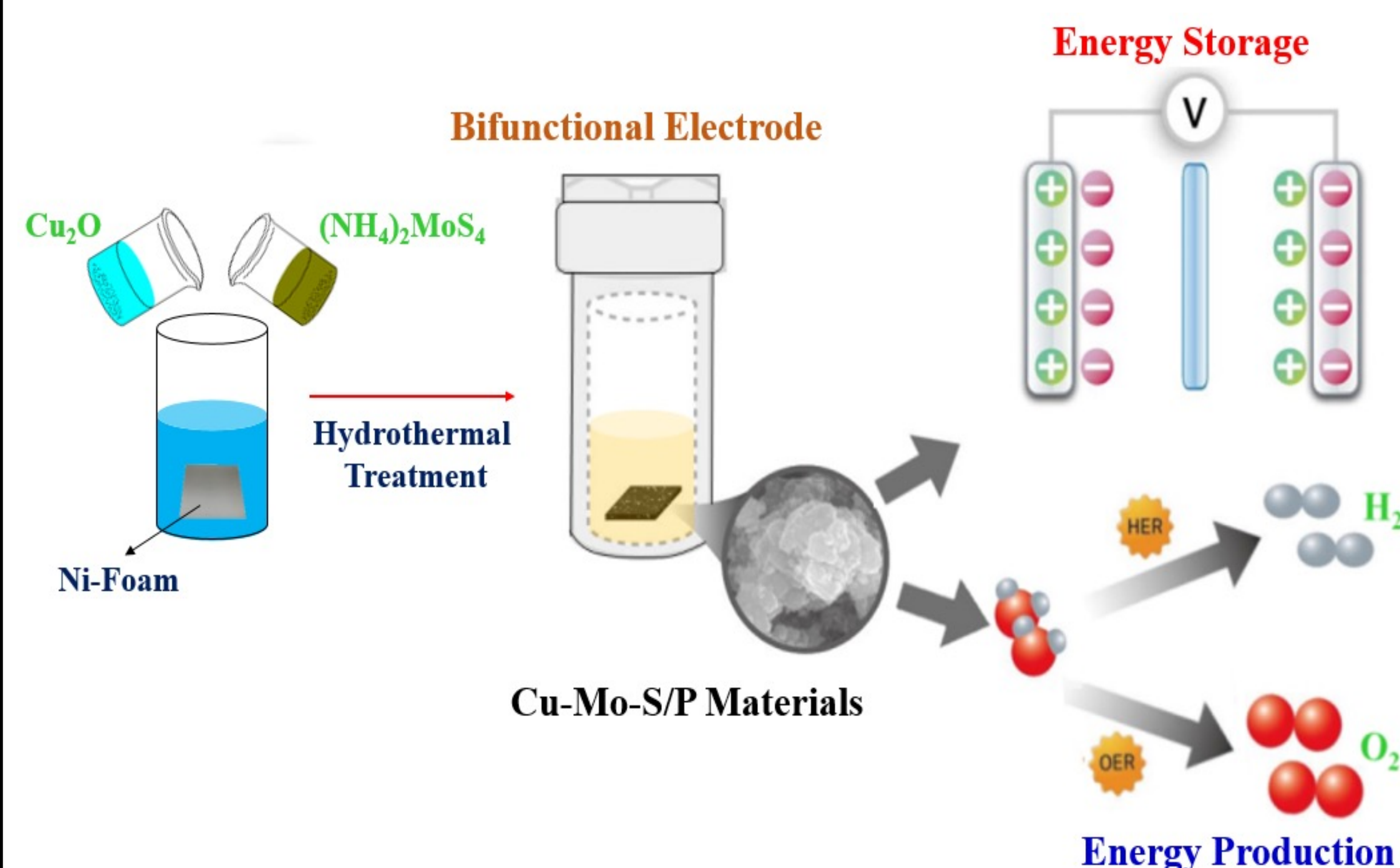


Figure: Schematic of the synthesized material for energy storage and production.

Results and discussion

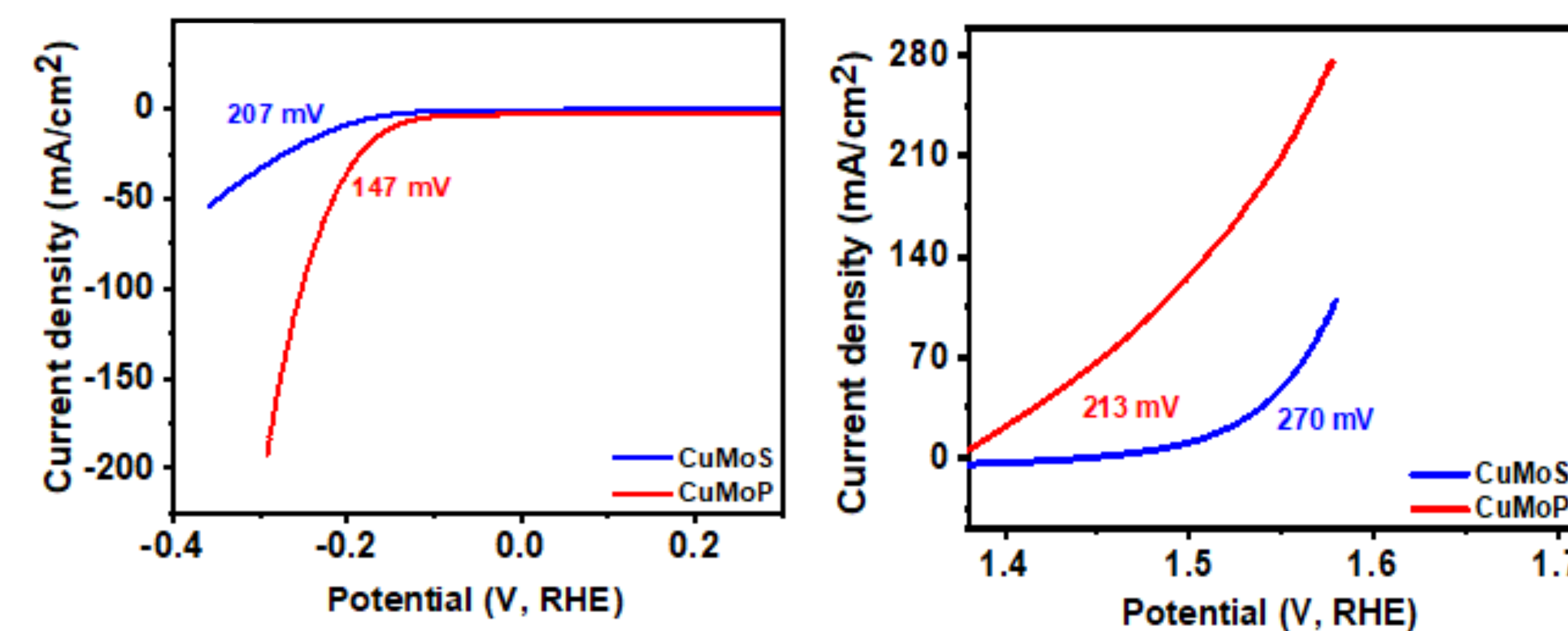


Figure: HER & OER LSV curves for CuMoS and CuMoP

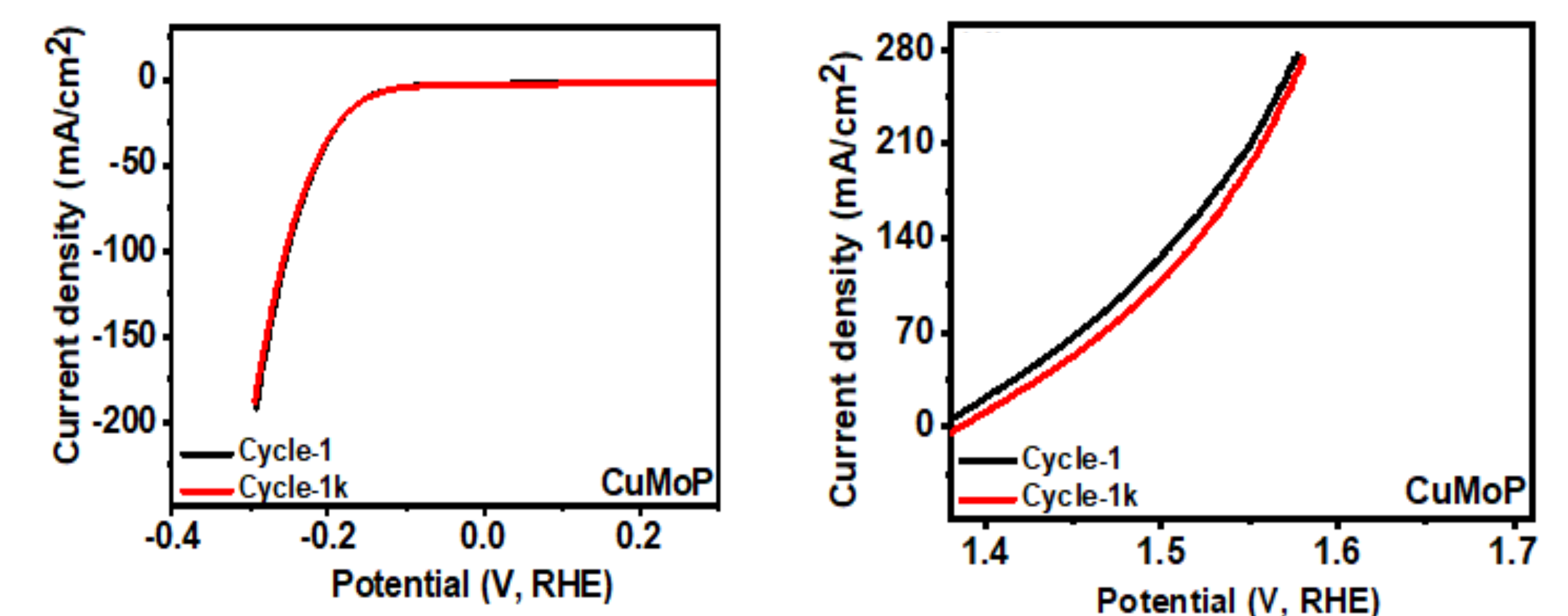


Figure: 1 and 1k HER&OER LSV curves for CuMoP

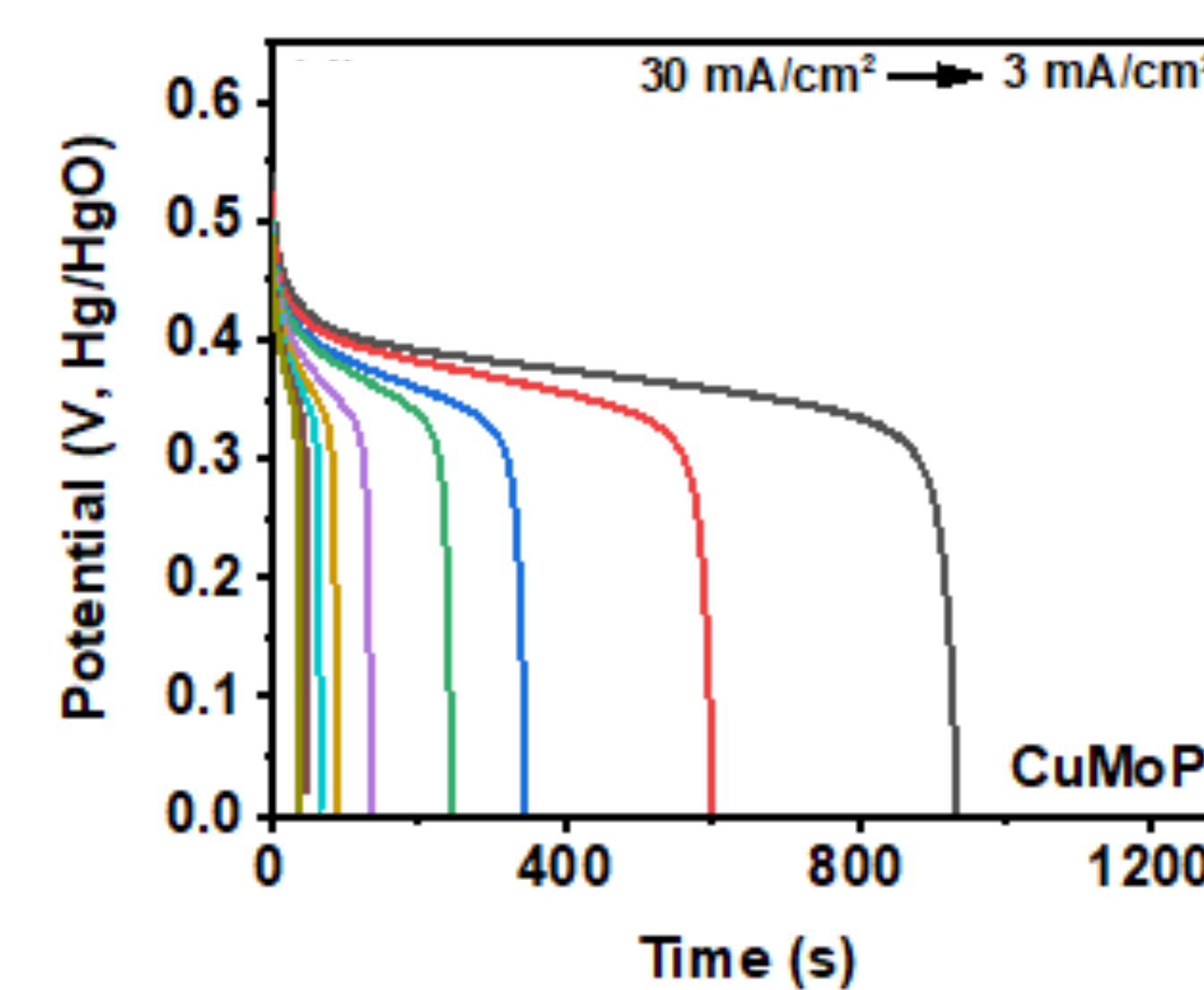


Figure: GCD curves of the CuMoP

electrode at different current densities
ranging from 3-30 mA/cm²

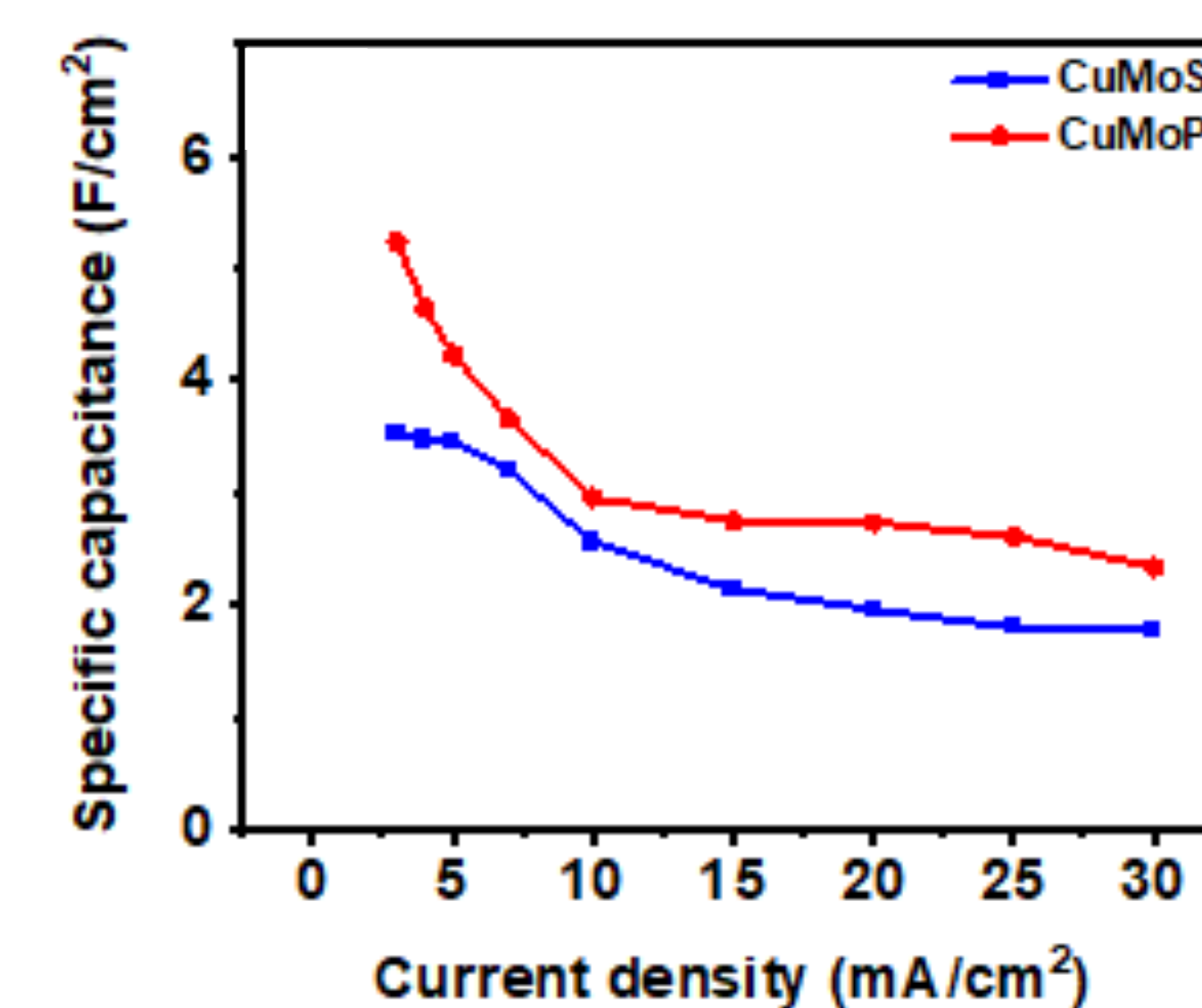


Figure: the variation of specific
capacitance versus current density

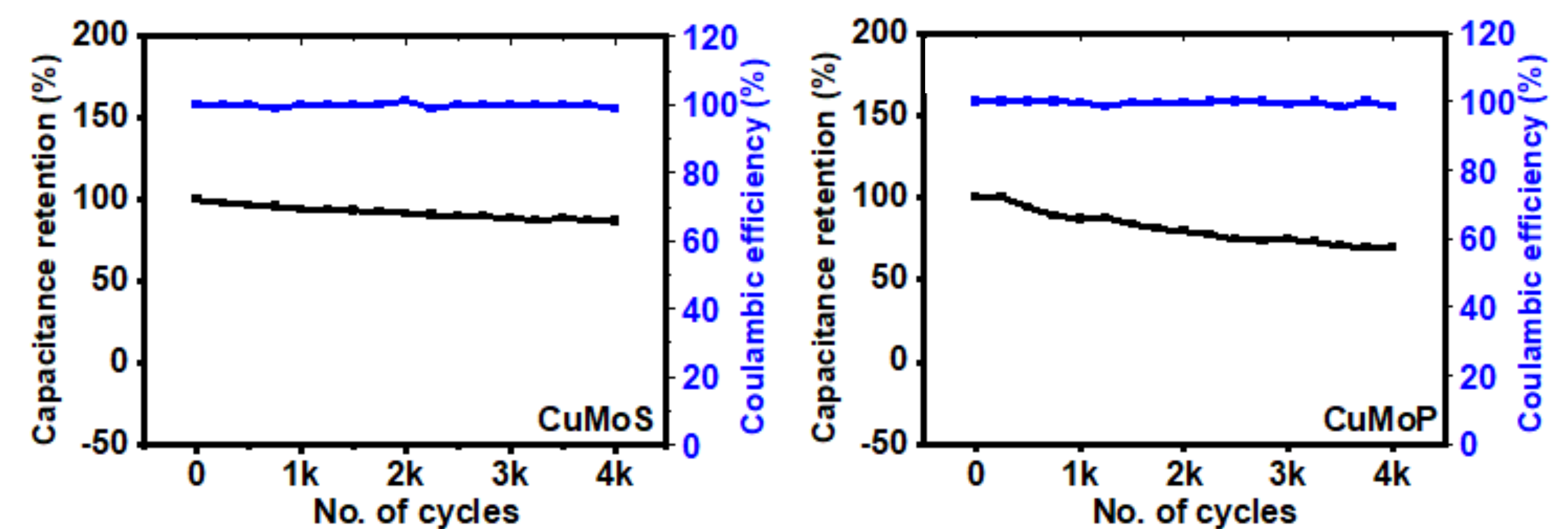


Figure: stability curve for CuMoS and CuMoP

Summary

- The Cu-Mo sulfide and phosphide materials were prepared via one-step hydrothermal and successive hydrothermal and phosphidation strategies.
- These materials possess nano-sized porous cotton-like architecture.
- The Cu-Mo sulfide and phosphide electrodes required HER overpotentials of 207 mV and 147 mV, along with 270 mV and 213 mV OER overpotentials at 10 mA/cm².
- The Cu-Mo sulfide and phosphide electrodes achieved the specific capacitances of 3.5 and 5.2 F/cm² at the current density of 3 mA/cm².

Acknowledgement

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