Supporting Information

Influence of the catalyst surface chemistry on the electrochemical self-coupling of biomass-derived benzaldehyde into hydrobenzoin

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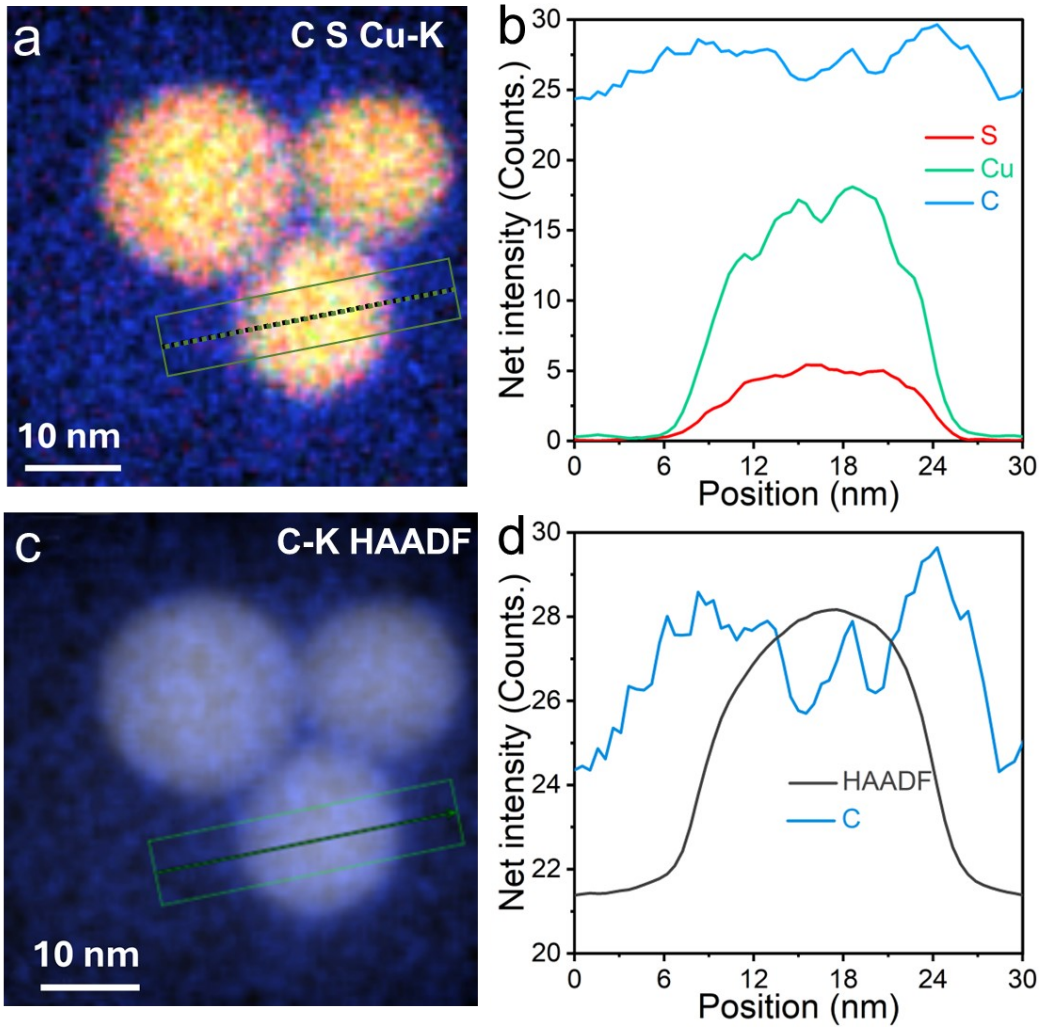

Figure S1. (a) STEM-EDS chemical composition map of different elements of Cu_2S-OAm NPs; (b) EDS linear profile of detected elements of Cu_2S-OAm NPs; (c) STEM-HAADF image of Cu_2S-OAm and element C mapping and (d) its EDS linear profile.

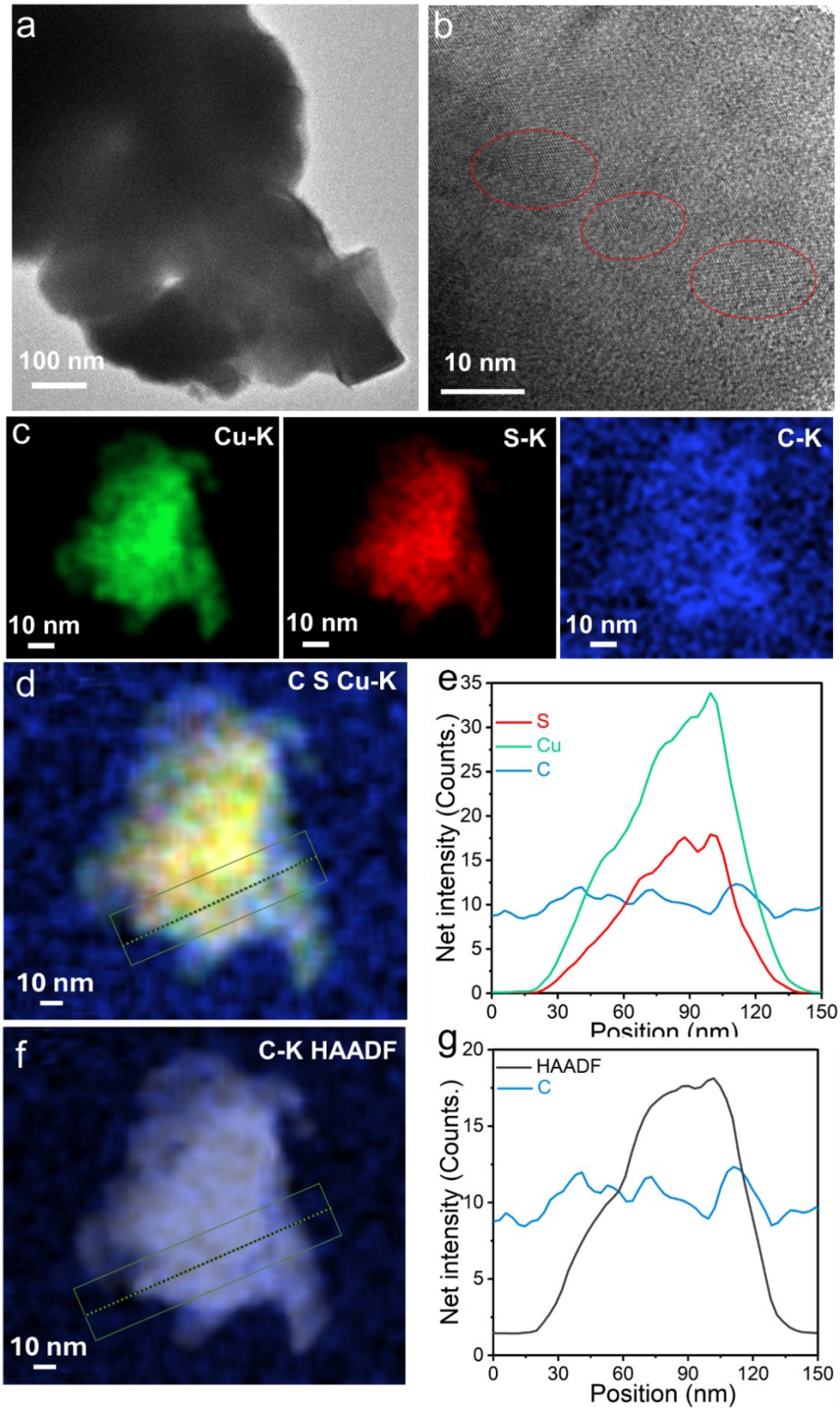

Figure S2. Structural and chemical characterization of Cu_2S. (a) TEM image; (b) High magnification TEM image; (c) STEM-EDS chemical composition maps of Cu_2S; (d) STEM-EDS chemical composition map of different elements; (e) EDS linear profile of detected elements; (f) STEM-HAADF image of Cu_2S and element C mapping and (g) its EDS linear profile.

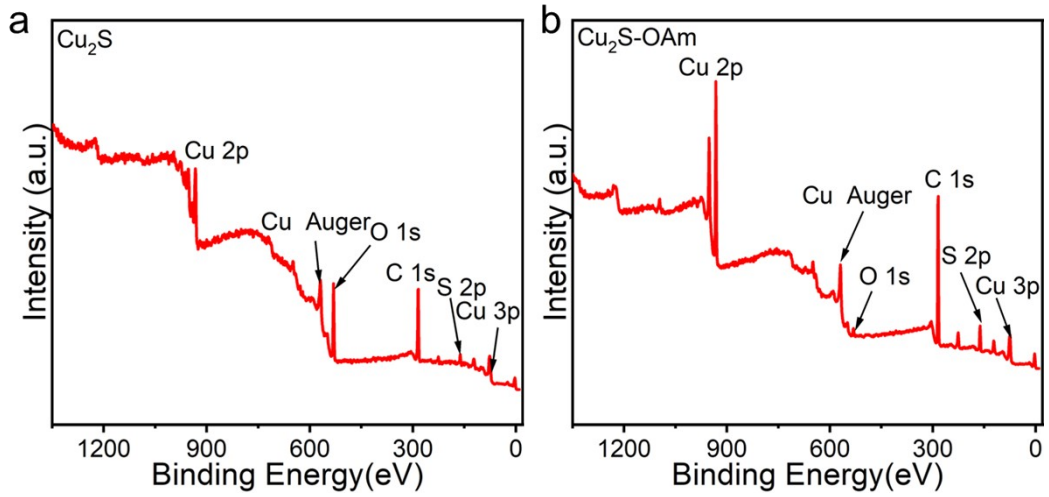

Figure S3. The XPS survey spectrum of Cu_2S and Cu_2S-OAm.

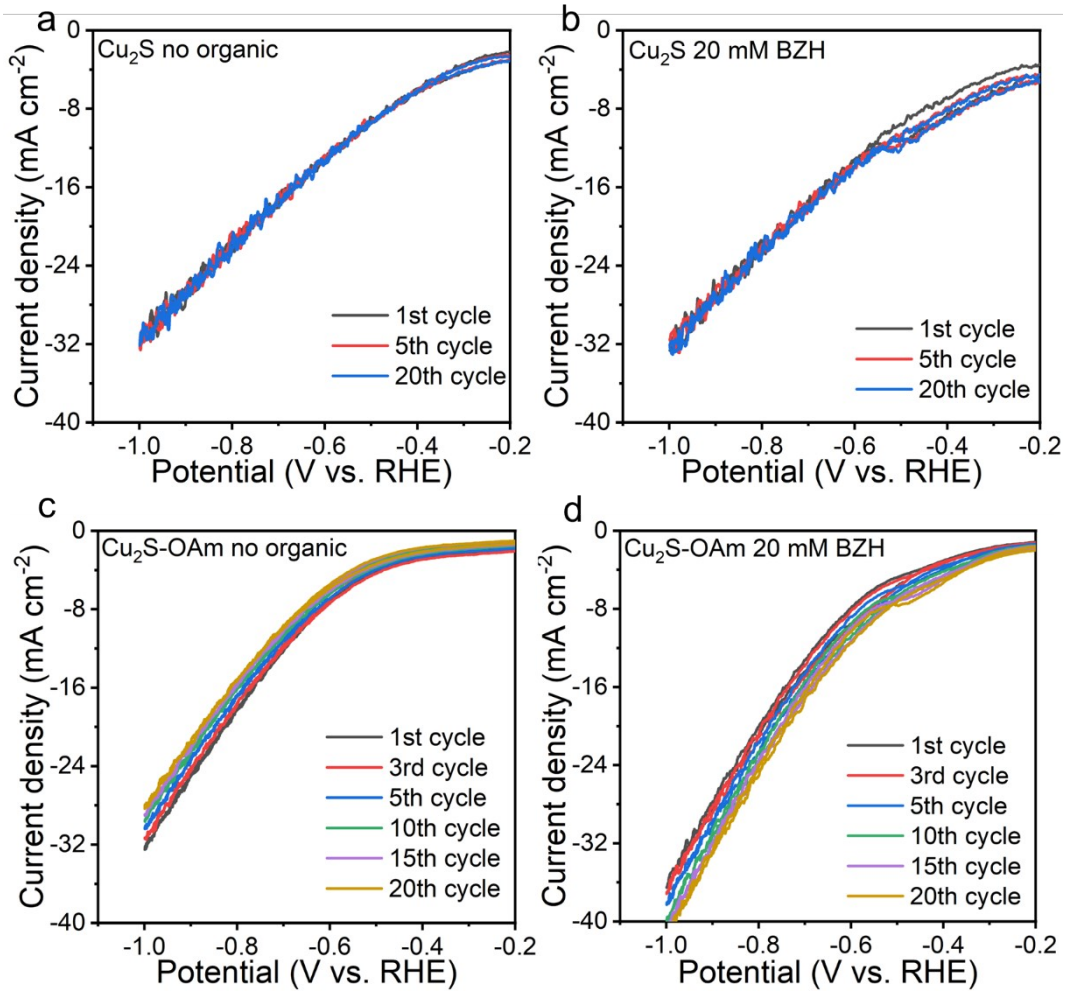

Figure S4. Stability tests using CV of (a) Cu_2S in 1 M sodium acetate-acetic acid electrolyte (pH=5.2); (b) Cu_2S in 1 M sodium acetate-acetic acid electrolyte (pH=5.2) and 20 mM BZH; (c) Cu_2S-OAm in 1 M sodium acetate-acetic acid electrolyte (pH=5.2); (d) Cu_2S-OAm in 1 M sodium acetate-acetic acid electrolyte (pH=5.2) and 20 mM BZH.

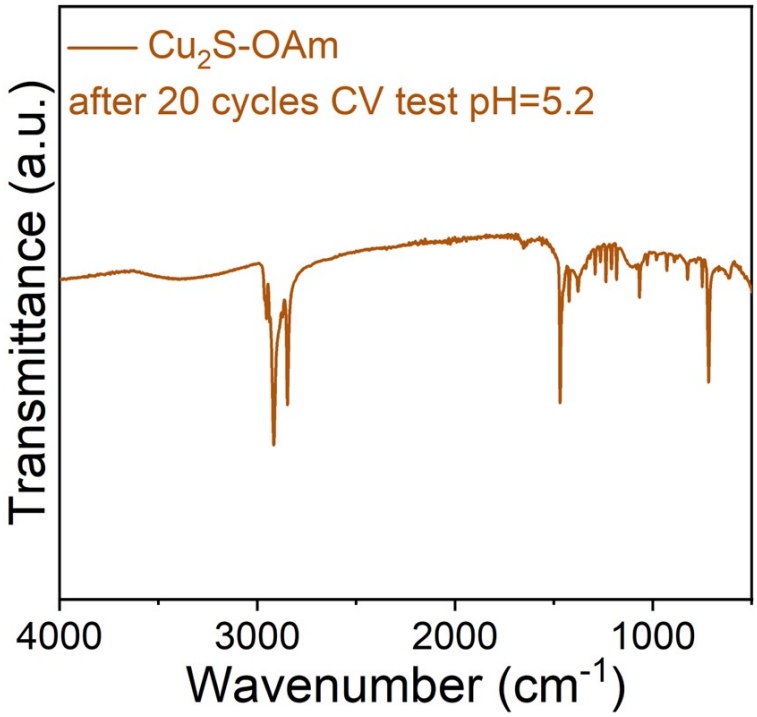

Figure S5. FTIR spectrum of Cu_2S-OAm after 20 cycles CV tests in 1 M sodium acetate-acetic acid electrolyte (pH=5.2) and 20 mM BZH.

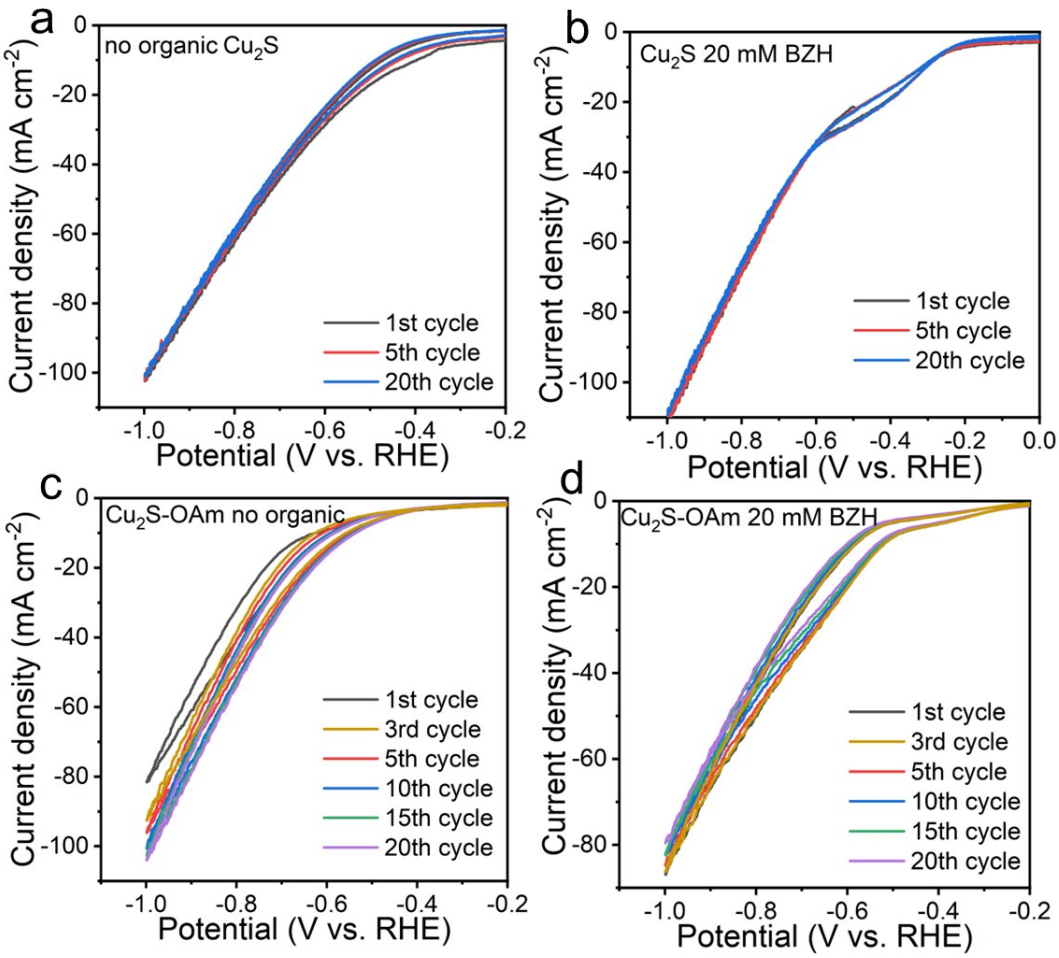

Figure S6. Stability tests of Cyclic voltammetry (CV) of (a) Cu_2S in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0); (b) Cu_2S in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0) and 20 mM BZH; (c) Cu_2S-OAm in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0); (d) Cu_2S-OAm in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0) and 20 mM BZH.

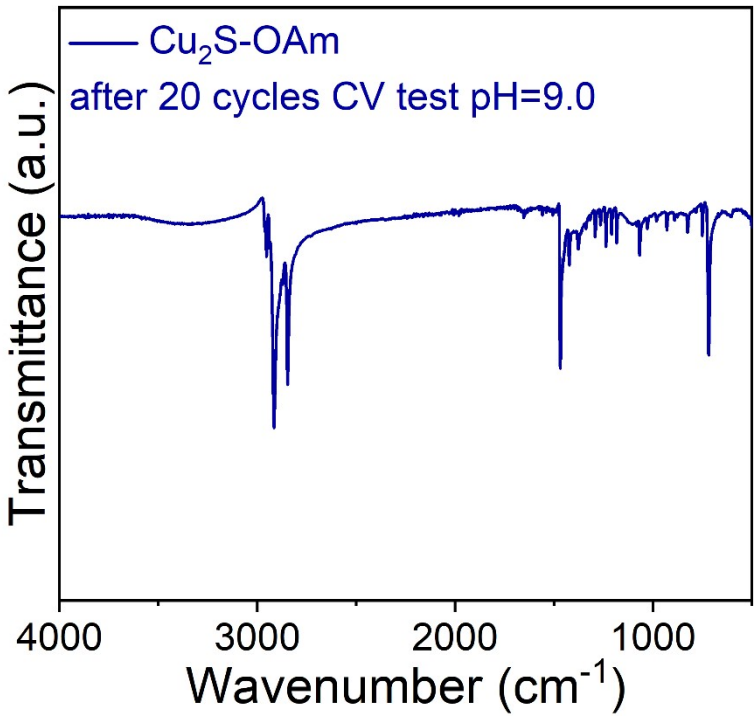

Figure S7. FTIR spectrum of Cu_2S-OAm after 20 cycles CV tests in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0) and 20 mM BZH.

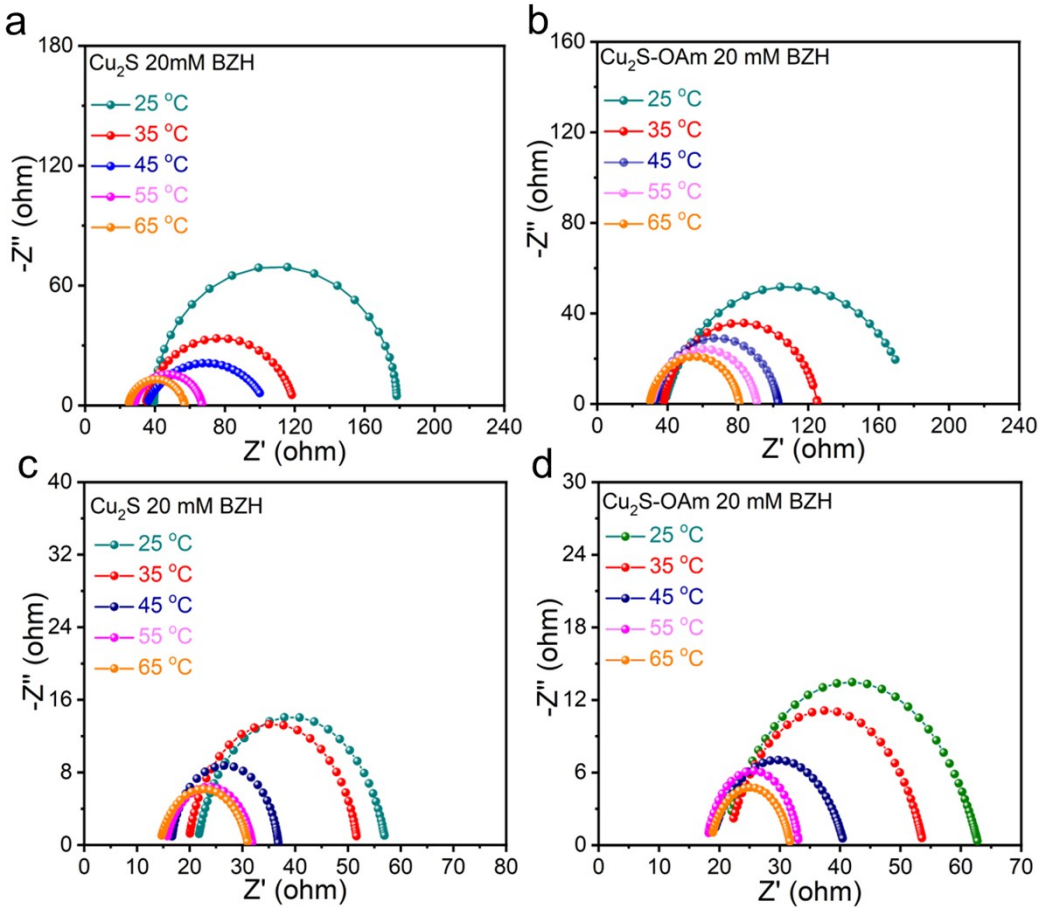

Figure S8. Nyquist plot of electrode material (a) Cu_2S; (b) Cu_2S-OAm in 1 M sodium acetate-acetic acid electrolyte (pH=5.2) and 20 mM BZH at different temperature; (c)Cu_2S; (d) Cu_2S-OAm in 1 M potassium carbonate-potassium bicarbonate electrolyte (pH=9.0) and 20 mM BZH.

Table S1. Summary of conversion of BZH at constant voltage -0.8 V vs. RHE at different pH on different electrode materials. at temperature of 25 °C.

	Electrode materials	BZH concentration (mM)	BZH Conv. %	HDB sel. %	BA sel. %
pH= 5.2	Cu_2S	20	7	62	38
	Cu_2S	40	12	60	40
	Cu_2S-OAm	20	8	88	12
	Cu_2S-OAm	40	15	86	14
pH= 9.0	Cu_2S	20	31	42	58
	Cu_2S	40	39	44	56
	Cu_2S-OAm	20	24	75	25

	Cu_2S-OAm	40	30	77	23