

## Supporting Information

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# Copper-bottomed: electrochemically active bacteria exploit conductive sulphide networks for enhanced electrogenicity

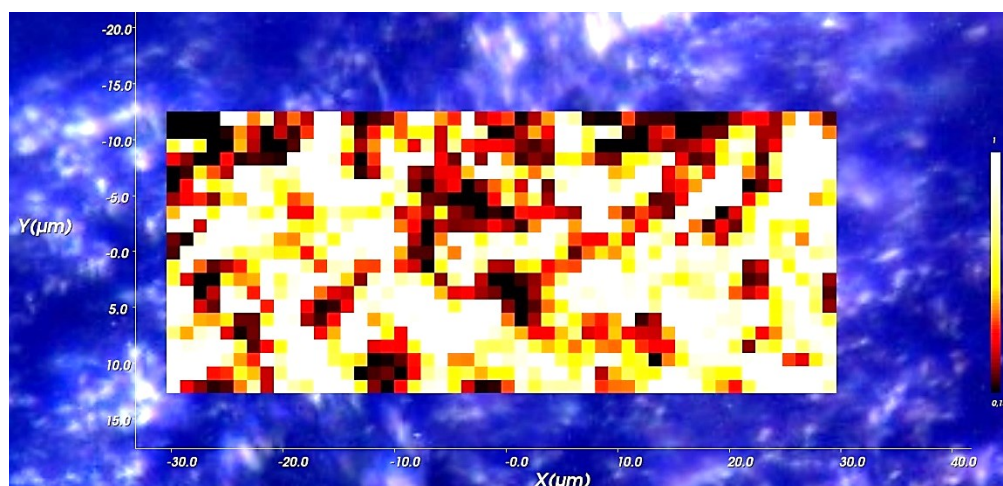
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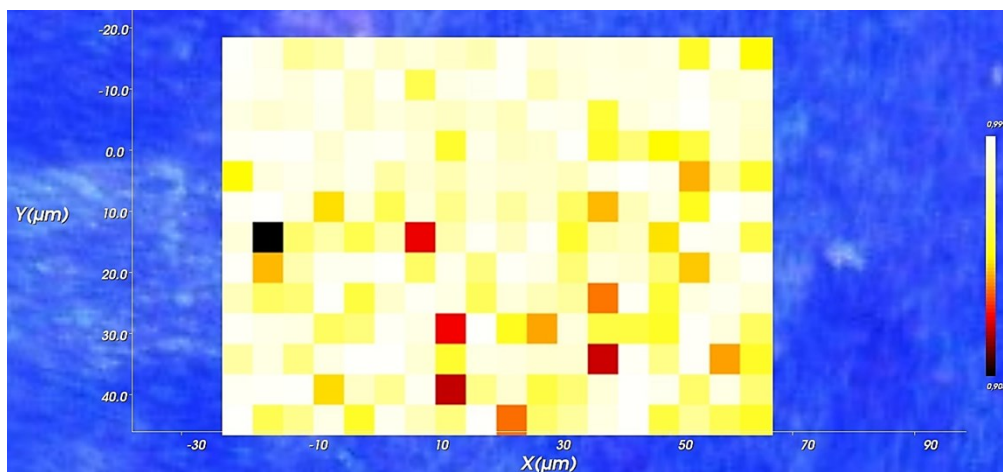
### Copper sulfide deposition on graphite and copper

The 2D-Raman mapping of copper sulfide after chemical deposition on the graphite electrode surface is given in Fig. SI-01A. The coloured rectangle shows the normalized peak intensities (0,147-1) of copper sulfide for the Raman Peak at 473 cm<sup>-1</sup> over the entire 2D mapping area. The mapping background reflects the confocal light-microscopic surface image of the CuS-covered graphite electrode.

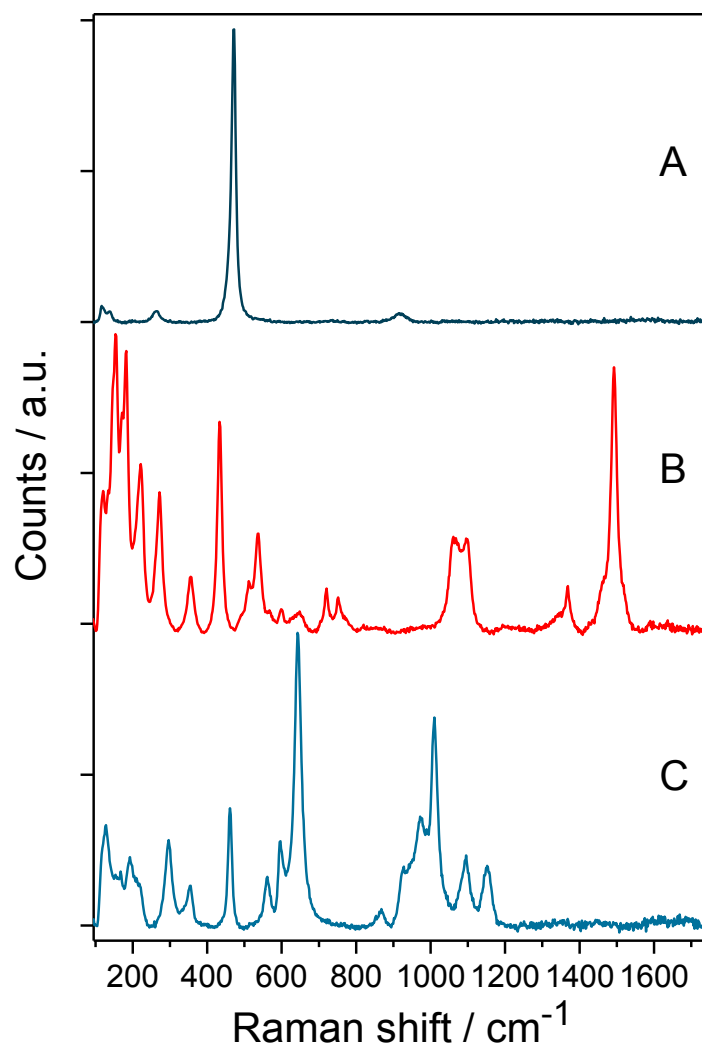


**Figure SI-01A:** Normalized 2D-Raman mapping of copper sulfide (473 cm<sup>-1</sup>) after chemical deposition on the graphite electrode surface. The mapping was measured with 5% laser intensity (532 nm) and 5 sec exposure time.

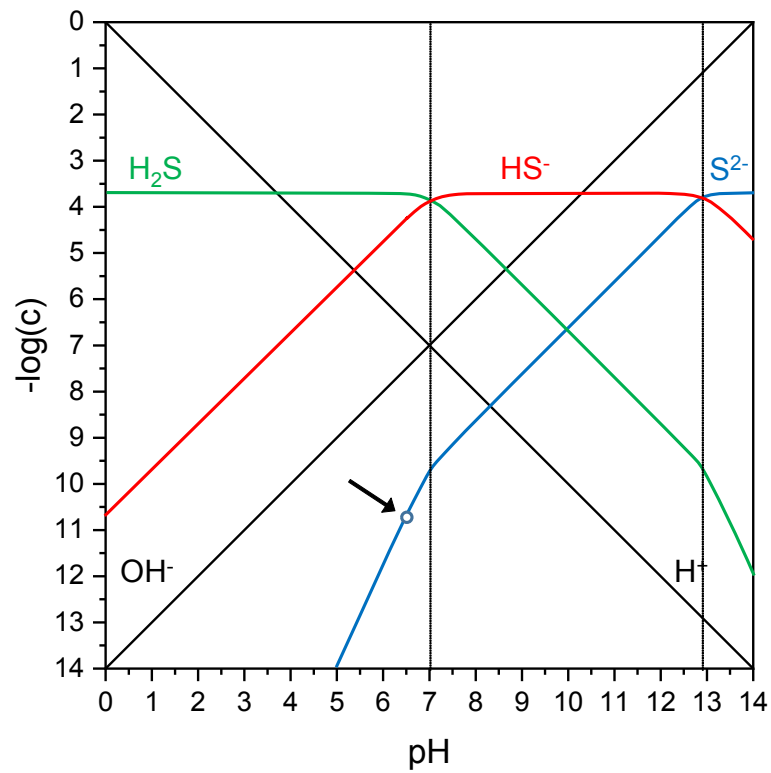
The 2D-Raman mapping of copper sulfide after electrochemical deposition on the copper electrode surface is given in Fig. SI-01B. The coloured rectangle shows the normalized peak intensities (0,9047-0,9998) of copper sulfide over the entire 2D mapping area. The mapping background reflects the confocal light-microscopic surface image of the CuS-covered copper electrode.



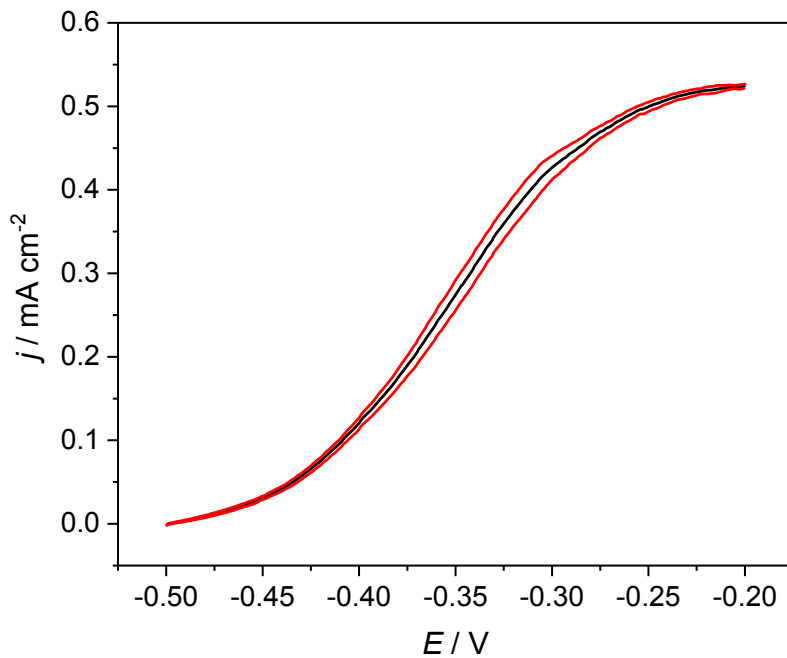
**Figure SI-01B:** Normalized 2D-Raman mapping of copper sulfide ( $473\text{ cm}^{-1}$ ) after electrochemical deposition on the copper electrode surface. The mapping was measured with 1% laser intensity (532 nm) and 10 sec exposure time.



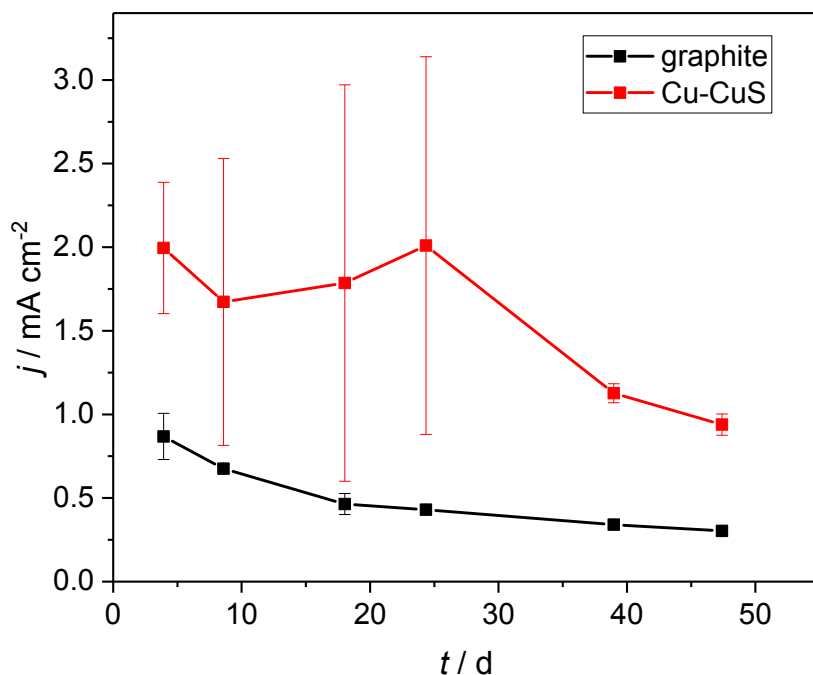
**Figure SI-02:** Raman Spectra of (A) Cu(II) sulfide, (B) Cu(II) carbonate and (C) Cu(II) phosphate. The sparingly soluble copper salts were precipitated on the surface of a copper electrode by electro-chemical copper oxidation in the presence of the respective anions in the electrolyte solution.



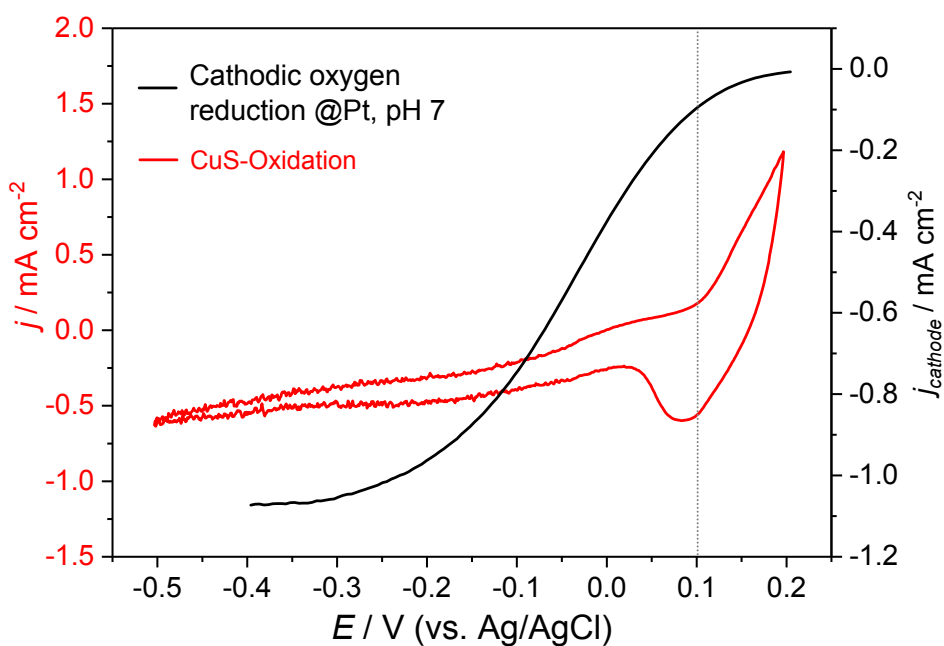
**Figure SI-03:** Bjerrum plot of protonation equilibria of the  $\text{S}^{2-}$ ,  $\text{HS}^-$  and  $\text{H}_2\text{S}$  system. The total concentration of sulfide species is assumed to be equal to the total concentration of sulphate ions ( $\text{SO}_4^{2-}$ ) in the growth medium ( $= 2 \times 10^{-4} \text{ mol L}^{-1}$ )



**Figure SI-04:** Turnover cyclic voltammogram (red curve) of a graphite based electrogenic biofilm and the corresponding net current resulting from the averaging of forward and reverse half-cycle (black curve). The scan rate was  $1 \text{ mV s}^{-1}$ .



**Figure SI-05:** Geometric current densities of electrochemically biofilms cultivated on CuS modified copper (red curve). The black curved illustrate the current density of biofilms cultivated at unmodified graphite.



**Figure SI-06:** Comparison of the cyclic voltammogram of a CuS modified graphite electrode in phosphate buffer solution (pH7) and the oxygen reduction reaction in the same medium (ORR data extracted from<sup>1</sup>). Please note that the bending of the voltammetric CuS curve to negative currents at potentials below 0V originates from an overlapping oxygen reduction due to dissolved oxygen in the electrolyte solution.