Modifying a bacterial microcompartment shell proteins to bind metal ions for electron transfer with electrodes

Scientific Achievement

Engineered a shell protein to incorporate copper for redox activity with an electrode surface

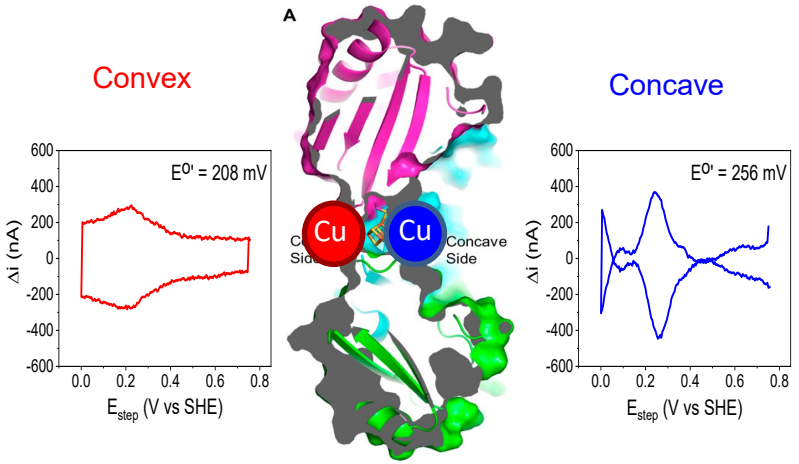
Significance and Impact

Demonstrates the ability to expand the functionality of engineered bacterial microcompartments to non-native applications. Harnessing natural biological processes to synthesize new materials are key for developing future functional bioreactors and biomaterials.

Research Details

- We designed, synthesized, and characterized a bacterial microcompartment shell protein for redox reactions by engineering either a Cu or [4Fe-4S] binding site.
- Protein film voltammetry demonstrates tunable redox activity when the protein is attached to an electrode surface, which is preferable to solution state reactivity for many biomaterials applications.

Engineered Cu coordination in BMC-T1 proteins: Site dependent redox activity



Electrode bound BMCs T1 proteins showed good electrochemical interactions when bound to an electrode, which could provide an infinite source/sink of electrons to the BMC as these structures continued to be developed for biotechnological applications.

Plegaria JS, Yates, MD, Glaven, SM, Kerfeld, CA. ACS *Applied Bio Materials*, Dec 2019; doi: 10.1021/acsabm.9b01023; Read pub

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