CATALYTIC TURNOVER OF [FEFE]-HYDROGENASE BASED ON SINGLE MOLECULE IMAGING

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Abstract

Hydrogenases catalyze the interconversion of protons, electrons and hydrogen. We investigated the enzymatic turnover of *Clostridium acetobutylicum* [FeFe]-hydrogenase through the use of electrochemical and scanning probe (STM) techniques[1]. Hydrogenase was adsorbed on carboxylate terminated alkyl thiols of 3, 4, 6 and 11 carbons self-assembled on a Au (111) surface (SAMs). STM revealed sub-monolayer surface coverage. Cyclic voltammetry yielded cathodic hydrogen production similar to that observed at a platinum electrode. From the direct observation of the single enzyme distribution on the Au-SAM surface, and the macroscopic electrochemical measurements obtained from the same electrode, the apparent turnover frequency per single enzyme molecule as a function of potential was determined. The turnover frequency at a given potential for the four SAMs yielded a decay constant for electronic coupling (β) through the SAM of ~ 1 per carbon in excellent agreement with published values for similar SAMs.

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References

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