Abstract

ATP Synthesis and Biosensing Coupled to the Electroenzymatic Activity of a Hydrogenase on an Electrode/Biomimetic Membrane Interface †

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Cells generate energy by coupling a proton gradient across a phospholipid bilayer membrane with the activity of a cross-membrane ATP synthase enzyme. In an effort to mimic this process in an artificial environment, we show that ATP can be efficiently produced starting from molecular hydrogen as a fuel. The proton concentration in an electrode/phospholipid bilayer interface can be controlled and monitored electrochemically by immobilizing the membrane-bound [NiFeSe]-hydrogenase from Desulfovibrio vulgaris Hildenborough [1]. The electro-enzymatic oxidation of H₂ generated a proton gradient across the supported biomimetic membrane that can be coupled to the in vitro synthesis of ATP by reconstituting ATP-synthase from E. coli on the biomimetic system [2]. Such a system is also suitable for developing an electrochemical biosensor of ATP.

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References


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