

Abstract

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

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[†] Presented at the 5th International Symposium on Sensor Science (I3S 2017), Barcelona, Spain, 27–29 September 2017.

Published: 29 November 2017

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.

Acknowledgement: This research was funded by the Spanish MINECO (Project CTQ2012-32448 and CTQ2015-71290-R) and by the Fundacao para a Ciencia e a Tecnologia (project PTDC/BBB- EP/0934/2012 and UID/Multi/04551/2013). I.L.-M acknowledges the European Research Council (ERC), grant no. ERC-StG-2013-338133 titled “MITOCHON” and RyC-2013-12609 from the Spanish MINECO.

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