POSTDOCTORAL FELLOWSHIP – UNIVERSITY OF BORDEAUX, FRANCE

AUTONOMOUS IN VIVO ELECTROCHEMICAL DRUG SYNTHESIS

Job offer

The drug-delivery aspect is an important aim for one of the main axes of the LABEX AMADEus. The construction of an autonomous device that can release a therapeutic molecule as a function of the biological demand is an important goal. We have very recently reported an approach allowing to synthesize molecules of high internal energy by harvesting low-energy delivering bioelectrochemical reactions (see NATURE COMMUNICATIONS (2018) 9:3229). This concept of thermodynamic upgrading has the advantage that both types of reactions occur in the same medium, which makes it intrinsically interesting for in vivo applications. The mechanism we described might allow e.g. the in situ generation of reactive oxygen species (ROS), needed for the regulation of several biological functions in the body, to suppress tumor growth and induce cell death at specific locations, even though their electrochemical synthesis needs rather high potentials. The goal of this post-doc is to explore the possibility of using a biofuel cell to drive in a closed system an electrolysis cell, able to generate locally specific drug metabolites by converting low energy educt molecules into higher energy consuming reaction products.

Electrical uncoupling of two electrochemical devices operating in the same reaction medium opens the door to an almost unlimited number of combinations of electricity producing and electricity consuming redox systems. This might be of particular relevance for in vivo systems where both, by definition, are located in the same solution. We plan to use a miniaturized biofuel cell operating with the conversion of glucose and oxygen to electrosynthesize model molecules of higher energy. In a first step this will be done in a classic two compartment set-up to test thermodynamic aspects, current efficiencies and yield. In the second part of the project both electrochemical devices will be integrated in a one compartment device and electrically decoupled via an electronic fly-back and boost converter. Potentially interesting precursors of drug molecules will be synthesized as model systems.

Candidate's profile

PhD in chemistry, know-how in physical-chemistry, electrochemistry, taste for a multidisciplinary project and team-work. He/she will be in charge of the set-up of the bioelectrochemical system and its testing with respect to the synthesis of organic molecules of high added value. Additional knowledge in electronics would be a plus.

Salary
2 300 €/month (net)

Application:

Applicants are invited to submit a complete CV, a motivation letter, a copy of PhD diploma, and references details at http://amadeus.labex.u-bordeaux.fr/en/Jobs/ job opportunity ref: 2018 AMADEus 070. Applications will be considered until the position is filled.

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