Seminar/Talk

Interfacing biocatalysts with synthetic materials for semi-artificial photosynthesis

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Semi-artificial photosynthesis interfaces biological catalysts with synthetic materials to overcome limitations in natural and artificial photosynthesis.1 This presentation will summarise my groups progress in integrating biocatalysts in bespoke hierarchical 3D electrode scaffolds and photoelectrochemical circuits.2 I will first discuss the fundamental insights gained into the function of water oxidising Photosystem II, where (i) unnatural charge transfer pathways have been revealed at the enzyme-electrode interface, and (ii) O2 reduction that short-circuits the water-oxidation process.3-5The wiring of Photosystem II to a H2 evolving hydrogenase or a CO2 reducing formate dehydrogenase has subsequently enabled the in vitro re-engineering of natural photosynthetic pathways using semi-artificial Z-scheme architectures.6-9 In contrast to natural photosynthesis, these hybrid systems allow panchromic light absorption by using complementary biotic and abiotic light absorbers. The underlying photoelectrochemical circuit provides effective electronic communication without losses to competing side-reactions. Progress in the integration of robust live cyanobacteria in 3D structured electrodes will also be discussed.10References(1) Kornienko et al., Nature Nanotech., 2018, 13, 890899(2) Mersch et al., J. Am. Chem. Soc., 2015, 137, 85418549(3) Zhang and Reisner, Nature Rev. Chem., 2020, in press.(4) Zhang et al., Nature Chem. Biol., 2016, 12, 10461052(5) Kornienko et al., J. Am. Chem. Soc., 2018, 140, 1792317931(6) Sokol et al., Nature Energy, 2018, 3, 944951(7) Nam et al., Angew. Chem. Int. Ed., 2018, 57, 1059510599(8) Sokol et al., J. Am. Chem. Soc., 2018, 140, 1641816422(9) Miller et al., Angew. Chem. Int. Ed., 2019, 58, 46014605(10) Zhang et al., J. Am. Chem. Soc., 2018, 140, 69

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Mondi Seminar Room 2, Central Building

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