Design of redox polymers for reagentless biosensors, biofuel cells, and photobioelectrochemistry

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Electron hopping in redox hydrogels is one of the major strategies to successfully wire enzymes with electrode surfaces simultaneously integrating all necessary molecular partners for biosensors, biofuel cells or photobioelectrochemical devices on the electrode surface. In addition, the controlled formation of the polymer film integrating the securely the active bioelectrochemical selectivity element is of high importance.
In this contribution, recent strategies to develop improved redox polymers for the mentioned applications will be discussed including:

- Flexible design of electrodeposition polymers with covalently and coordinatively bound redox moieties
- Redox polymers based on quinone-type redox moieties for improved electron transfer from FAD units inside redox proteins at low potentials
- Redox polymers for optimized wiring of billirubin oxidase and laccase
- Redox polymers for wiring photosystem 1 and photosystem 2 with electrodes as a basis for photosynthesis-like energy harvesting
- Improving stability of redox polymer enzyme composites by pH-induced activation of crosslinkers and covalent binding to functionalized electrode surfaces.

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