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Enzyme-like Electrocatalysis of Protein Size Redox Nanoparticles in Two- and three-dimensional Assemblies

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The development of low-cost, robust and high-efficient nanoscale electrocatalysts is a dream approach to the use of nanomaterials as key building blocks in design and construction of chemical and biological sensing devices as well as fuel cells. Electroactive nanoparticles are a type of nanoparticles that have intrinsic redox activity. One of representative examples is *Prussian Blue* nanoparticles (PBNPs) and their analogues. This presentation will address: (1) synthesis of PBNPs with protein sizes (e.g., 5 nm), (2) two- and three-dimensional assemblies of the nanoparticles, (3) control of electron transport (ET), and (4) features of enzyme-like electrocatalysis. These latest progresses could offer crucial clues for understanding of electronic characteristics, optimization of design of nanoscale electrocatalysts and their applications in sensors.

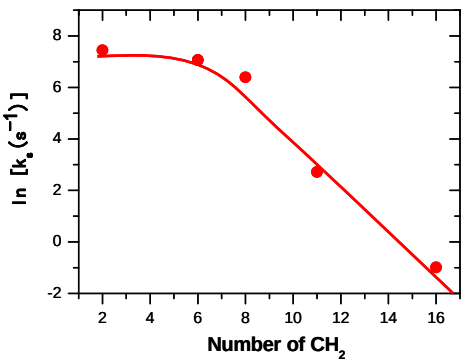

Fig. 1. Distance-dependent ET kinetics of PBNPs in 2D assembly, clearly showing the feature of tunnelling mechanism.

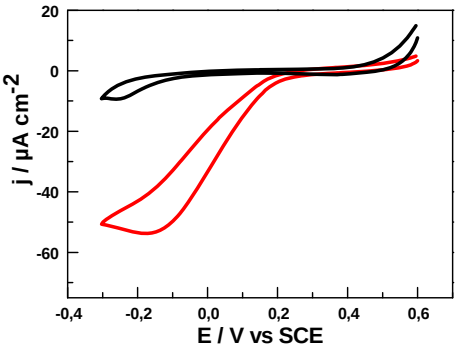

Fig. 2. High-efficient electrocatalysis toward reduction of hydrogen peroxide with (red) and without (black) PBNPs. Electrolyte: 0.1 M KCl, scan rate: 20 mV s^{-1}.

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