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Gold Nanoparticles-Enhanced Proton Exchange Membrane (PEM) Fuel Cell HONGFEI LI, CHENG PAN, Stony Brook University, PING LIU, YIMEI ZHU, RADOSLAV ADZIC, Brookhaven National Laboratory, MIRIAM RAFAILOVICH, Stony Brook University — Proton exchange membrane fuel cells have drawn great attention and been taken as a promising alternated energy source. One of the reasons hamper the wider application of PEM fuel cell is the catalytic poison effect from the impurity of the gas flow. Haruta has predicted that gold nanoparticles that are platelet shaped and have direct contact with the metal oxide substrate to be the perfect catalysts of the CO oxidization, yet the synthesis method is difficult to apply in the Fuel Cell. In our approach, thiol-functionalized gold nanoparticles were synthesized through two-phase method developed by Brust *et al.* We deposit these Au particles with stepped surface directly onto the Nafion membrane in the PEM fuel cell by Langmuir–Blodgett method, resulting in over 50% enhancement of the efficiency of the fuel cell. DFT calculations were conducted to understand the theory of this kind of enhancement. The results indicated that only when the particles were in direct surface contact with the membrane, where AuNPs attached at the end of the Nafion side chains, it could reduce the energy barrier for the CO oxidation that could happen at $T < 300\text{K}$.

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