Title:	Pt Nanoparticle Anchored Molecular Self-Assemblies of DNA: An Extremely Stable and Efficient HER Electrocatalyst with Ultralow Pt Content
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Abstract:	An efficient electrocatalytic hydrogen evolution reaction (HER) with ultralow loading of Pt has been under intense investigation to make the state-of-the-art Pt economically affordable for water electrolyzers. Here, colloidally synthesized Pt nanoparticles of average size 3.5 ± 0.3 nm were successfully anchored on molecular self-assemblies of DNA. The synthesized Pt@DNA colloidal solution was directly assessed for the electrochemical hydrogen evolution reaction (HER) in 0.5 M H2SO4 with a loading of 5 μL of Pt@DNA colloidal solution that corresponds to a Pt equivalent of 15 μg/cm2. The excellent adhesion of DNA onto GC and FTO substrate electrodes, the conductivity of DNA, and its stability upon potentiostatic electrolysis and accelerated degradation have made the synthesized, stable Pt@DNA colloidal solution an advanced HER electrocatalyst. The Pt@DNA–GC interface without binder required overpotentials of −0.026 and −0.045 V for current densities of 10 and 20 mA/cm2, respectively. The potentiostatic electrolysis and accelerated degradation tests did not affect the electrocatalytic activity, and the observed increase in overpotential was highly negligible. The extreme stability of the Pt@DNA–GC interface was witnessed during an aging study carried out by keeping the working electrode in the electrolyte solution for more than 10 days and acquiring linear sweep voltammograms (LSVs) at intervals of 24 h. Under the same experimental conditions, the commercial Pt/C 10 wt % catalyst with Nafion binder had failed to compete with our colloidal Pt@DNA. These findings certainly indicate the advantageous use of electrocatalyst-loaded DNA molecular self-assemblies for the HER which has never been observed before.
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