Enabling direct H₂O₂ production through rational electrocatalyst design.

Future generations require more efficient and localized processes for energy conversion and chemical synthesis. The continuous on-site production of hydrogen peroxide would provide an attractive alternative to the present state-of-the-art, which is based on the complex anthraquinone process. The electrochemical reduction of oxygen to hydrogen peroxide is a particularly promising means of achieving this aim. However, it would require active, selective and stable materials to catalyse the reaction. Although progress has been made in this respect, further improvements through the development of new electrocatalysts are needed. Using density functional theory calculations, we identify Pt-Hg as a promising candidate. Electrochemical measurements on Pt-Hg nanoparticles show more than an order of magnitude improvement in mass activity, that is, A g⁻¹ precious metal, for H₂O₂ production, over the best performing catalysts in the literature.
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