

Direct synthesis of H₂O₂ from H₂ and O₂ over palladium nanocatalysts immobilized on functionalized resin

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Hydrogen peroxide, widely used in almost all industrial areas, is commercially produced by the anthraquinone oxidation (AO) process. However, this process requires significant energy input and generates waste, which has a negative effect on its sustainability and production costs. An alternative method is direct synthesis of H₂O₂ (DSHP) from H₂ and O₂. The DSHP process is conceptually the most ideal and straight forward reaction for producing H₂O₂ in industry. However, preparations of precisely tailored catalysts are still under progress for large scale production of H₂O₂. Here, we present highly efficient and industrially relevant catalyst for the direct synthesis of H₂O₂ from H₂ and O₂ prepared by the immobilization of Pd nanocatalysts onto a functionalized resin. The continuous production of 8.9 wt% H₂O₂ and high productivity (180 g H₂O₂ g Pd⁻¹ h⁻¹) is achieved under intrinsically safe and less-corrosive conditions without any loss of activity. We expect this approach is a substantial improvement of nanocatalysts for direct synthesis of H₂O₂ from H₂ and O₂