Fast microwave-assisted synthesis of FePd catalysts supported on carbon materials for the direct synthesis of H_2O_2

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The direct synthesis of H_2O_2 is a promising candidate that closely satisfies the requirement for an ideal H_2O_2 production. While carbon supported noble metal catalysts have been extensively used in the DSHP reaction, a simple Pd/C catalyst usually exhibits a low H_2O_2 yield, particularly without use of acid/halide promoters. In this work, a range of FePd/C catalysts was prepared by the impregnation of cationic Pd ions on various carbon supports, followed by the simultaneous microwave-irradiated CNT growth and reduction. The pyrolysis of ferrocene and other carbon sources efficiently regulated the Pd NP size during the microwave-irradiated reduction of Pd. The use of hexane as an additional carbon source was efficient in decreasing Pd NP size as well as increasing Pd^{2+}/Pd^0 ratio, which was beneficial in attaining a high H_2O_2 selectivity. In the presence of FePd/GR-H catalyst, H_2O_2 productivity and selectivity reached as high as 1492.3 mmol H_2O_2/g-Pd.h and 68.8%, respectively. The excellent catalytic activity clearly demonstrates that microwave irradiation can fine-tune catalytic activity by controlling the geometric and electronic features of Pd on the carbon supports.