

Pd Catalyzed Reversible Formic acid Dehydrogenation and Production

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Reversible hydrogen production-storage cycle was achieved mediated by carbon dioxide and formic acid by Pd nanoparticles supported on graphitic carbon nitride. Formic acid was successfully dehydrogenated to produce CO free hydrogen gas under ambient conditions with high turnover frequency. In addition, formic acid could reversibly be regenerated by carbon dioxide reduction. Graphitic carbon nitride played important roles in stabilizing Pd to give small sized nanoparticles, in deprotonating an acidic proton of formic acid to initiate dehydrogenation, and in adsorbing carbon dioxide to facilitate carbon dioxide reduction. This is the first example of reversible chemical hydrogen storage using formic acid at a single heterogeneous catalyst.