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Zeolite-Encaged Single-Atom Rhodium Catalysts: Highly-Efficient Hydrogen Generation and Shape-Selective Tandem Hydrogenation of Nitroarenes

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Shape-Selective Hydrogenation of Nitroarenes by Using Zeolite-Encaged Single-Atom Rhodium Catalysts

Category

Polymer-Supported Synthesis

Key words

rhodium catalysis

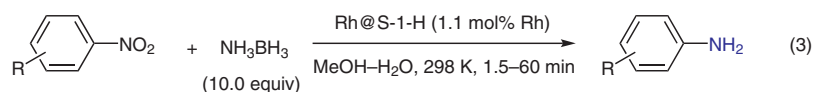
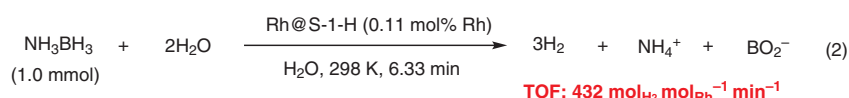
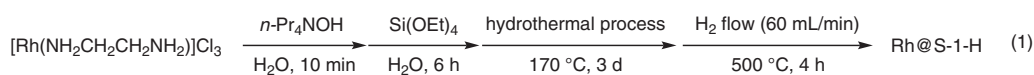
reduction

nitroarenes

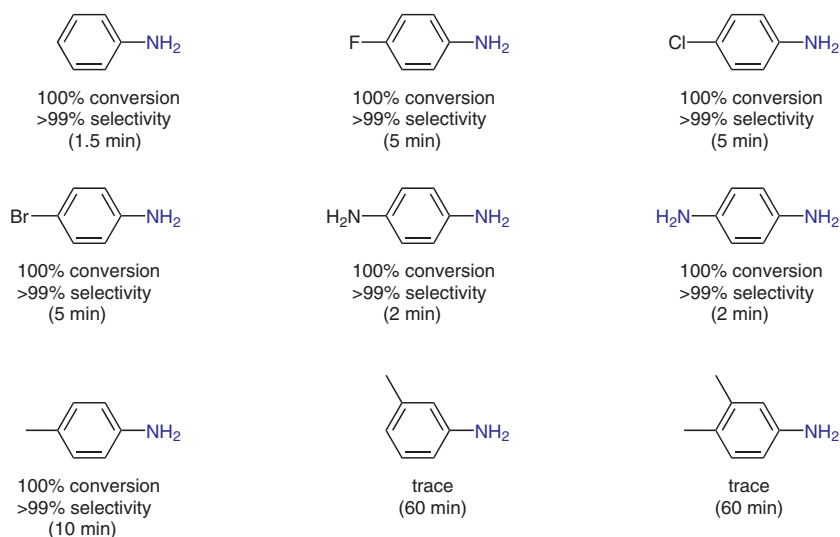
ammonia–borane

anilines

Synfact
of the
Month



Results:



Significance: A single-atom rhodium catalyst immobilized on silicate-1 zeolite (Rh@S-1-H), prepared as shown in equation 1, catalyzed the hydrolysis of ammonia–borane with a turnover frequency of 432 mol_{H₂} mol_{Rh}⁻¹ min⁻¹ (eq. 2). A sequential hydrolysis of ammonia–borane and hydrogenation of nitroarenes also proceeded in the presence of Rh@S-1-H (eq. 3).

Comment: As shown in equation 3, *p*-substituted nitrobenzenes were reduced to the corresponding anilines with 100% conversion and >99% selectivity, whereas *m*-substituted nitrobenzenes were almost intact after the hydrogenation reaction. Rh@S-1-H was characterized by means of ¹³C MAS-NMR, TG-DTA, PXRD, ICP-AES, HAADF-STEM, HRTEM, SEM, EDS, XPS, XANES, EXAFS, and CO-DRIFTS measurements.

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