Reductive Amination of Carbonyl Compounds on Nb$_2$O$_5$-Supported Ruthenium

**Significance:** Nb$_2$O$_5$-supported ruthenium nanoparticles (Ru/Nb$_2$O$_5$) were prepared by mixing Nb$_2$O$_5$ with an aqueous solution of Ru(NO)(NO$_3$)$_3$, followed by treatment under flowing H$_2$/argon at 673 K (eq. 1). Ru/Nb$_2$O$_5$ promoted the reductive amination of carbonyl compounds 1 with NH$_3$ and H$_2$ to give the corresponding primary amines 3 in ≥98% yield (eq. 2).

**Comment:** Ru/Nb$_2$O$_5$ prevented the formation of secondary amines and undesired hydrogenated byproducts. Ru/Nb$_2$O$_5$ was characterized by means of SEM, STEM, TPR, XRD and FT-IR analyses. Ru/Nb$_2$O$_5$ was recovered and reused three times without loss of its catalytic activity (2f; first reuse: 99% yield; second reuse: 93%; third reuse: 94%).

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**Results:**

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\begin{align*}
\text{O} & \quad \text{MeOH (5 mL)} \quad 363K, 1–18 h \\
R^1 & \quad \text{NH}_2 \quad R^2 \\
\text{MeO} & \quad \text{2a} \quad 83\% \text{ yield} \\
\text{F} & \quad \text{2b} \quad 90\% \text{ yield} \\
\text{Cl} & \quad \text{2c} \quad 96\% \text{ yield} \\
\text{Br} & \quad \text{2d} \quad 98\% \text{ yield} \\
\text{O} & \quad \text{2e} \quad 91\% \text{ yield} \\
\text{NH}_2 & \quad \text{2f} \quad 98\% \text{ yield} \\
\text{F} & \quad \text{2g} \quad 98\% \text{ yield} \\
\text{OH} & \quad \text{2h} \quad 57\% \text{ GC yield} \\
\text{S} & \quad \text{2i} \quad 85\% \text{ GC yield} \\
\text{N} & \quad \text{2j} \quad 91\% \text{ yield} \\
\text{NH}_2 & \quad \text{2k} \quad 96\% \text{ GC yield} \\
\text{H}_2 (2 \text{ MPa}) & \quad \text{2l} \quad 90\% \text{ yield} \\
\end{align*}
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