Nanoporous Gold Catalyst for the Selective Semihydrogenation of Alkynes

**Significance:** A nanoporous gold catalyst (AuNPore), which was prepared by dealloying a homogeneous Au$_{30}$Ag$_{70}$ alloy in nitric acid (70 wt%), catalyzed the semihydrogenation of alkynes with organosilanes and water as the hydrogen source to afford the corresponding alkenes. The reaction of phenylacetylene with PhMe$_2$SiH and water in DMF proceeded in the presence of 2 mol% of AuNPore to give styrene as the sole product (method A: 35 °C, 3 h, 96% yield). 1-Dodecyne underwent the semihydrogenation efficiently in acetonitrile with 50 mol% of pyridine (method B: 80 °C, 8 h, 98% yield).

**Comment:** The catalytic ability of various catalysts was examined for the semihydrogenation of phenylacetylene: AuNPore (96%), AuCl (18%), Au$_{30}$Ag$_{70}$ alloy (0%), PdNPore (54%), and Pd/C (20%). The authors proposed the reaction pathway including the generation of the H$^+$ on the AuNPore surface ([AuNPore-H$^+$]) and pyridinium cation ([HPy$^+$]) which subsequently react with the alkynes to form the corresponding Z-alkenes.

**Selected examples:**

- **Ph** + PhMe$_2$SiH + H$_2$O $\rightarrow$ Ph-R$_1^-R_2^+$
  - 96% yield, method A
- **n-C$_8$H$_{17}$** + PhMe$_2$SiH + H$_2$O $\rightarrow$ R$_1^-R_2^+$
  - 98% yield, method B
- **Hex** + CO$_2$Me + PhMe$_2$SiH + D$_2$O $\rightarrow$ R$_1^-R_2^+$
  - 80% yield, (4:1)
- **Ph** + CO$_2$Et + PhMe$_2$SiH + D$_2$O $\rightarrow$ R$_1^-R_2^+$
  - 80% yield, (2:1)

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