Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

Kenichi Shimizu,*[a] Katsuya Shimura,[a] Masanari Nishimura,[b] and Atsushi Satsuma[b]

[a] Catalysis Research Center, Hokkaido University, N-21, W-10, Sapporo 001-0021, Japan

[b]Department of Molecular Design and Engineering, Graduate School of Engineering, Nagoya University, Nagoya 464-8603, Japan

*Corresponding author: e-mail: kshimizu@cat.hokudai.ac.jp, Fax: +81-11-706-9163

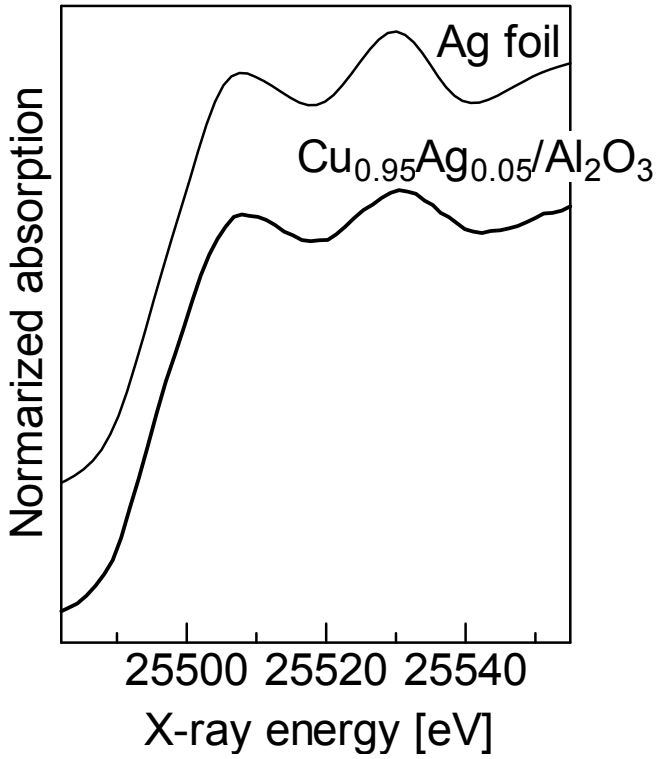


Fig. S1 Ag K-edge XANES spectra.

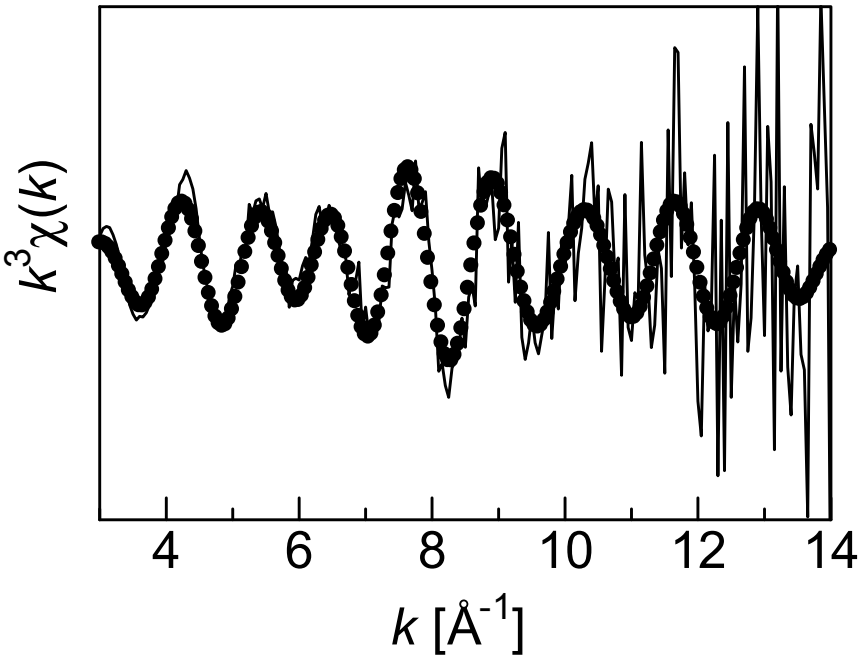


Fig. S2 The inverse Fourier transform of k^3-weighted Ag K-edge EXAFS spectrum of (solid line) $Cu_{0.95}Ag_{0.05}/Al_2O_3$ (Cu+Ag= 10 wt%) and (•) its best fit derived from curve-fitting analysis.

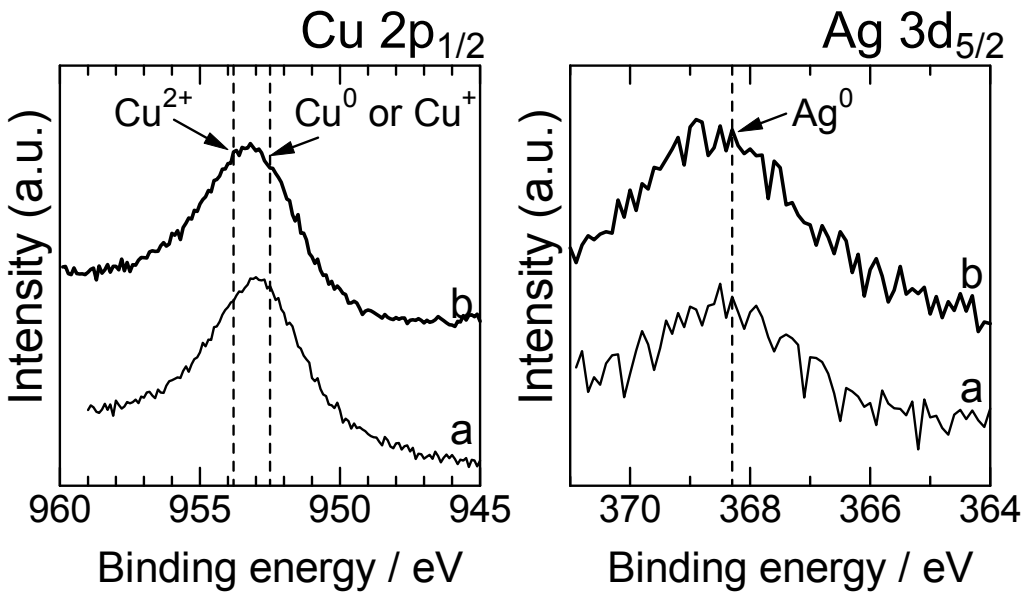
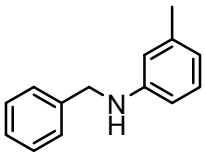


Fig. S3 XPS spectra in the $Cu2p_{1/2}$ and Ag $3d_{5/2}$ regions for $Cu_{0.95}Ag_{0.05}/Al_2O_3$ (Cu+Ag= 10 wt%) (a) after H_2-reduction and (b) after its use in the reaction of **1** and **2**.

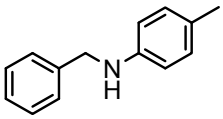
^{1}H-NMR and GC/MS Analysis: ^{1}H-NMR spectra were recorded in $CDCl_3$ with TMS as an internal standard at ambient temperature on a Varian INOVA-500 operating at 500 MHz.

Benzyl-*m*-tolyl-amine



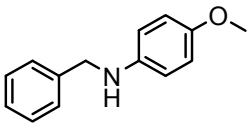
^{1}H NMR ($CDCl_3$): δ 7.43 – 7.32 (m, 5H, aromatic) , δ 7.11 (t, J=7.6Hz, 1H, aromatic) , δ 6.59 (d, J=7.9Hz, 1H, aromatic) , δ 6.51 (s, 1H, aromatic) , δ 6.49 (d, J=8.4Hz, 1H, aromatic) , δ 4.36 (s, 2H, CH_2) , δ 3.98 (br, 1H, NH) ,δ 2.32 (s, 3H, CH_3).
MS: *m/z* (relative intensity) 197 (M^+,51), 91 (100).

Benzyl-*p*-tolyl-amine



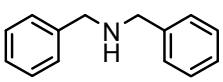
^{1}H NMR ($CDCl_3$): δ 7.37 – 7.21 (m, 5H, aromatic) , δ 6.97 (d, J=8.4Hz, 2H, aromatic) , δ 6.56 (d, J=8.4Hz, 2H, aromatic) , δ 4.31 (s, 2H, CH_2) , δ 3.90 (br, 1H, NH) , δ 2.23 (s, 3H, CH_3).
MS: *m/z* (relative intensity) 197 (M^+,46), 91 (100).

***N*-Benzyl-4-methoxyaniline**



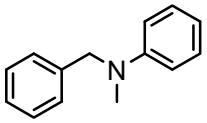
^{1}H NMR ($CDCl_3$): δ 7.36 – 7.20 (m, 5H, aromatic) , δ 6.76 (d, J=9Hz, 2H, aromatic) , δ 6.57 (d, J=9Hz, 2H, aromatic) , δ 4.25 (s, 2H, CH_2) , δ 3.71 (s, 3H, OCH_3) , δ 3.58 (br, 1H, NH).
MS: *m/z* (relative intensity) 212 (M^+,10), 213 (100).

Dibenzylamine



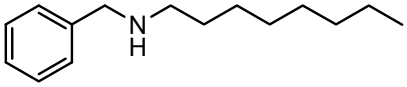
^{1}H NMR ($CDCl_3$): δ 7.40 – 7.18 (m, 10H, aromatic) , δ 3.79 (s, 4H, CH_2) , δ 1.76 (br, 1H, NH).
MS: *m/z* (relative intensity) 196 (M^+,10), 91 (100)

_N_-Benzyl-_N_-methylaniline



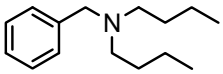
^{1}H NMR ($CDCl_3$): δ 7.31 – 7.15 (m, 7H, aromatic) , δ 6.73 – 6.65 (m, 3H, aromatic) , δ 4.48 (s, 2H, CH_2) , δ 3.03 (s, 3H, CH_3).
MS: *m/z* (relative intensity) .

_N_-Octylbenzylaniline



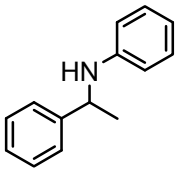
^{1}H NMR ($CDCl_3$): δ 7.28 – 7.19 (m, 5H, aromatic) , δ 3.50 (s, 2H, CH_2) , δ 2.34 (t, J=7Hz, 4H, CH_2) , δ 1.40 – 1.35 (m, 4H, CH_2) , δ 1.24 – 1.20 (m, 4H, CH_2) , δ 0.82 (t, J=7Hz, 4H, CH_3).
MS: *m/z* (relative intensity) 219 (M^+,2), 91 (100).

_N_,_N_-Dibutylbenzylamine



^{1}H NMR ($CDCl_3$): δ 7.28 – 7.19 (m, 5H, aromatic) , δ 3.50 (s, 2H, CH_2) , δ 2.34 (t, J=7Hz, 4H, CH_2) , δ 1.40 – 1.35 (m, 4H, CH_2) , δ 1.24 – 1.20 (m, 4H, CH_2) , δ 0.82 (t, J=7Hz, 4H, CH_3).
MS: *m/z* (relative intensity) 219 (M^+,2), 91 (100).

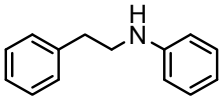
_N_-Phenylehylaniline



^{1}H NMR ($CDCl_3$): δ 7.36 – 7.12 (m, 7H, aromatic) , δ 6.74-6.62 (m, 3H, aromatic) , δ

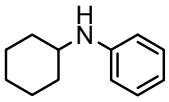
4.50-4.48 (m, 1H, CH) , δ 4.02 (br, 1H, NH) , δ 1.51 (d, J=7.0Hz, 3H, CH_3).
MS: *m/z* (relative intensity) 197 (M^+,75), 182 (100).

_N_-Phenethylaniline



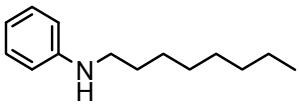
^{1}H NMR ($CDCl_3$): δ 7.30 – 7.10 (m, 7H, aromatic) , δ 6.67 (t, J=7Hz, 1H, aromatic) , δ 6.55 (d, J=8Hz, 2H, aromatic) , δ 3.58 (br, 1H, NH) , δ 3.32 (t, J=7Hz, 2H, CH_2) , δ 2.83 (t, J=7Hz, 2H, CH_2).
MS: *m/z* (relative intensity) 197 (M^+,8), 106 (100).

_N_-Cyclohexylaniline



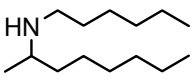
^{1}H NMR ($CDCl_3$): δ 7.20 – 7.09 (m, 2H, aromatic) , δ 6.67 – 6.55 (m, 3H, aromatic) , δ 3.49 (br, 1H, NH) , δ 3.27 – 3.18 (m, 1H, CH) , δ 2.06 – 2.01 (m, 2H, CH_2) , δ 1.77 – 1.62 (m, 3H, CH_2) , δ 1.42 – 1.05 (m, 5H, CH_2).
MS: *m/z* (relative intensity) 175 (M^+,28), 132 (100).

_N_-Octylaniline



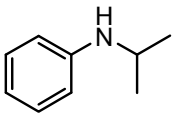
^{1}H NMR ($CDCl_3$): δ 7.19 – 7.09 (m, 2H, aromatic) , δ 6.65 – 6.56 (m, 3H, aromatic) , δ 3.52 (br, 1H, NH) , δ 3.03 (t, J=7Hz, 2H, CH_2) , δ 1.57 – 1.52 (m, 2H, CH_2) , δ 1.27 (br, 10H, CH_2) , δ 0.82 (t, J=7Hz, 3H, CH_3).
MS: *m/z* (relative intensity) 205 (M^+,16), 106 (100).

_N_-Hexyl(1-methylheptyl)amine



^{1}H NMR ($CDCl_3$): δ 2.34 – 2.28 (m, 3H, CH_2) , δ 1.50 – 1.36 (m, 3H, CH_2, NH) , δ 1.26 – 1.21 (m, 16H, CH_2) , δ 1.00 (d, J=6.2Hz, 3H, CH_3) , δ 0.83 – 0.79 (m, 6H, CH_3).
MS: *m/z* (relative intensity) 213 (M^+,3), 128 (100).

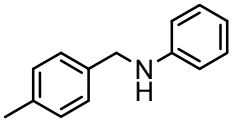
_N_-Isopropylaniline



^{1}H NMR ($CDCl_3$): δ 7.35 – 7.31 (m, 2H, aromatic) , δ 6.91 – 6.84 (m, 1H, aromatic) , δ 6.80 – 6.77 (m, 2H, aromatic) , δ 3.83 – 3.75 (m, 1H, CH) , δ 3.95 (br, 1H, NH).

MS: *m/z* (relative intensity) 135 (M^+,25), 120 (100).

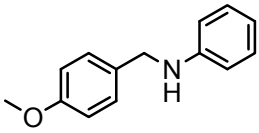
_N_-(4-Methylbenzyl)aniline



^{1}H NMR ($CDCl_3$): δ 7.26 – 7.12 (m, 6H, aromatic) , δ 6.73 – 6.60 (m, 3H, aromatic) , δ 4.26 (s, 2H, CH_2) , δ 3.95 (br, 1H, NH) ,δ 2.33 (s, 3H, CH_3).

MS: *m/z* (relative intensity) 197 (M^+,39), 105 (100).

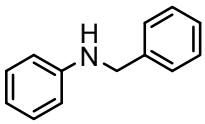
_N_-(4-Methoxylbenzyl)aniline



^{1}H NMR ($CDCl_3$): δ 7.25 – 7.10 (m, 4H, aromatic) , δ 6.85 – 6.56 (m, 5H, aromatic) , δ 4.19 (s, 2H) , δ 3.88 (br, 1H, NH) ,δ 3.74 (s, 3H, OCH_3).

MS: *m/z* (relative intensity) 213 (M^+,14), 121 (100).

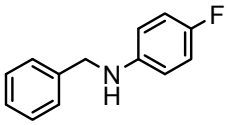
.**_N_-Benzylaniline**



^{1}H NMR ($CDCl_3$): δ 7.37 – 7.24 (m, 5H, aromatic) , δ 7.16 (t, J=8.4Hz, 2H, aromatic) , δ 6.70 (t, J=7.2Hz, 1H, aromatic) , δ 6.63 (d, J=5.9Hz, 2H, aromatic) , δ 4.32 (s, 2H, CH_2) , δ 4.01 (br, 1H, NH).

MS: *m/z* (relative intensity) 183 (M^+,53), 91 (100).

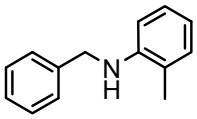
_N_-Benzyl-4-fluoroaniline



^{1}H NMR ($CDCl_3$): δ 7.34 – 7.17 (m, 5H, aromatic) , δ 6.72 (d, J=9Hz, 2H, aromatic) , δ 6.63 (d, J=9Hz, 2H, aromatic) , δ 4.30 (s, 2H, CH_2) , δ 4.01 (br, 1H, NH).

MS: *m/z* (relative intensity) 201 (M^+,34), 109 (100).

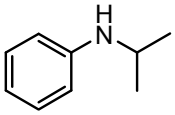
Benzyl-*o*-tolyl-amine



^{1}H NMR ($CDCl_3$): δ 7.40 – 7.30 (m, 5H, aromatic) , δ 7.14 – 7.08 (m, 2H, aromatic) , δ 6.68 (t, J=7.6Hz, 1H, aromatic) , δ 6.62 (d, J=8.4Hz, 1H, aromatic) , δ 4.38 (s, 2H, CH_2) , δ 3.86 (br, 1H, NH) ,δ 2.17 (s, 3H, CH_3).

MS: *m/z* (relative intensity) 197 (M^+,40), 91 (100).

_N_-Isopropylaniline



^{1}H NMR ($CDCl_3$): δ 7.35 – 7.31 (m, 2H, aromatic) , δ 6.91 – 6.84 (m, 1H, aromatic) , δ 6.80 – 6.77 (m, 2H, aromatic) , δ 3.83 – 3.75 (m, 1H, CH) , δ 3.95 (br, 1H, NH).

MS: *m/z* (relative intensity) 135 (M^+,25), 120 (100).