**Supplementary material**

*Sapindus mukorossi* seed shell extract mediated green synthesis of CuO nanostructures: An efficient catalyst for C–N bond-forming reactions

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**Characterization of the catalyst**

The synthesized CuO was characterized by different spectroscopic, microscopic and diffractometric techniques. X-ray diffraction (XRD) study of the dried powder samples was carried out on an X’Pert Pro (Panalytical) powder X-ray diffractometer using Cu $k_α$ radiation with a wavelength of 0.154 nm at an accelerating voltage of 40 kV with 35 mA current. For the scanning electron microscopic (SEM) study, a small amount of the dry powder samples was spread on carbon tape pasted on an aluminium stub and then sputter-coated with platinum to minimize the charging effect. The micrographs were then recorded in a field emission scanning electron microscope (FESEM) (Carl ZEISS Sigma 300VP) at an accelerating voltage of 5 kV. An energy-dispersive X-ray (EDX) spectroscopy study was performed on Oxford Instrument attached to the electron microscope. For transmission electron microscopic (TEM) studies, a drop of an aqueous suspension of an individual powder sample was cast on a carbon-coated copper grid. The excess solutions were soaked with tissue paper followed by drying in the air. The micrographs were then recorded in a high–resolution JEOL electron microscope (JEM
2100EM) at an accelerating voltage of 200 kV. X-ray photoelectron spectroscopy (XPS) analyses of the dried powder samples were performed in JEOL makes X-ray photoelectron spectrometer (JPS 9030) using Mg $k_a$ radiations with an incident energy of 1253.6 eV under ultrahigh vacuum. The charging effect on the sample was corrected by setting the binding energy of the carbon (C-1s) at 284.6 eV and this carbon peak was used as a reference position for scaling all the other peaks. The nitrogen ($N_2$) gas adsorption-desorption isotherms of the CuO NPs were recorded at 77 K (Quantachrome Nova 1000 Instrument) after degassing the powder samples at 120 ºC for 2 h in an inert atmosphere. Brunauer-Emmett-Teller (BET) specific surface areas and pore diameters of the samples were determined from the adsorption-desorption isotherms following the well-known Barrett-Joyner-Halenda (BJH) method. $^1H$ and $^{13}C$ NMR spectra were recorded in a JNM ECS 400 MHz NMR spectrophotometer (JEOL) using tetramethylsilane (TMS) as the internal standard. Chemical shift values and coupling constants are expressed in ppm and Hz.
Figure S1. N\textsubscript{2} gas adsorption-desorption curve for samples CuO-2 and CuO-4.
Characterization of the catalytic products:

**Entry 1:** 3-Phenylamino-propionitrile

![3-Phenylamino-propionitrile](image)

Physical appearance: Brown coloured solid

$^1$H NMR (CDCl$_3$, 400 MHz): $\delta$ 7.18 (t, 2H, $J$=7.2Hz), 6.72 (t, 1H, $J$=7.6Hz), 6.57 (d, 2H, $J$=8Hz), 3.46 (t, 2H, $J$=6.40Hz), 2.57(t, 2H, $J$=6.4Hz) ppm.

$^{13}$C NMR (CDCl$_3$, 125 MHz): 146.25, 129.89, 119.32, 118.48, 113.62, 40.12, 19.724 ppm.

**Entry 4:** 3-$p$-Tolylamino-propionitrile

![3-$p$-Tolylamino-propionitrile](image)

Physical appearance: Brown coloured solid

$^1$H NMR (CDCl$_3$, 400 MHz): $\delta$ 7.0125 (d, $J$=8.4Hz, 2H), 6.540 (d, $J$=8.4Hz, 2H) 3.491 (t, $J$=6.4Hz, 2H), 2.613 (t, $J$=6.4Hz, 2H), 2.224 (s, 3H) ppm.

$^{13}$C NMR (CDCl$_3$, 125 MHz): 143.74, 130.14, 128.22, 118.59, 113.48, 40.06, 20.41, 18.07 ppm.

**Entry 5:** 3-((4-hydroxyphenyl)amino) propanenitrile

![3-((4-hydroxyphenyl)amino) propanenitrile](image)

Physical appearance: Black coloured crystal

$^1$H NMR (CDCl$_3$, 400 MHz): $\delta$ 2.66 (t, 2H), 3.22 (d, 2H), 5.21 (1H, s), 6.46-6.48 (d, $J$= 8Hz, 2H), 6.56-6.58 (d, $J$= 8Hz, 2H), 8.48 (s, 1H)
**Entry 8:** 3-(diethylamino)propanenitrile

![Chemical Structure](image)

**Physical appearance:** Light brown colored semisolid

**$^1$H NMR (CDCl₃, 400 MHz):** \( \delta 2.764 (t, J=6.8, 2H) \), \( 2.510 (q, J=7.2Hz, 4H) \), \( 2.404 (t, J=7.2Hz, 2H) \), \( 1.001 (t, J=7.2Hz, 6H) \) ppm.

**$^{13}$C NMR (CDCl₃, 125 MHz):** 119.176, 48.409, 46.49, 15.97, 11.928 ppm.
$^1$H and $^{13}$C NMR spectra of some isolated products

$^1$H NMR spectra of 3-phenylamino-propionitrile (Entry 1)

$^{13}$C NMR spectra of 3-phenylamino-propionitrile (Entry 1)
$^{1}H$ NMR spectra of 3-p-tolylamino-propionitrile (Entry 4)

$^{13}C$ NMR spectra of 3-p-tolylamino-propionitrile (Entry 4)
$^1$H NMR spectra of the product 3-((4-hydroxyphenyl)amino) propanenitrile (Entry 5)
$^1$H NMR spectra of the product 3-(diethylamino)propanenitrile (Entry 8)

$^{13}$C NMR spectra of the product 3-(diethylamino)propanenitrile (Entry 8)