**Boosting Catalytic Efficiency of Nanostructured CuO-Supported Doped-CeO2 in Oxidative Coupling of Benzyl amines to N-Benzylidenebenzyl amines and Benzimidazoles: Impact of Acidic and Defect Sites**

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1. **Catalyst Characterization**

Powder X-ray diffraction analysis was performed on a Rigaku multiplex diffracto meter using a nickel-filtered Cu Kα (λ= 0.15418nm) light and a scintillation counter detector. Samples scanned 2theta values from 2–80° at a scan rate of 2° per minute. The Scherrer equation was used to calculate the average crystallite size of the prepared samples.

BET-specific surface area analyses were carried out at 468.75 K of temperature using a Micro meritics ASAP 2010 instrument. Each sample was degassed at 423 K for 4 h prior to analysis.

TEM studies were performed on a JEOLJEM-2100f equipment with a slow-scanning CCD camera and an electron beam accelerating voltage of 80kV. Sample preparation consisted of sonicating in acetone for30min, followed by placing a drop of sonicated sample on a Cu-grid supporting the porous carbon film and allowing it to dry.

XPS analysis of all the catalysts was carried out using a ThermoK-5 Alpha XPS equipment with a 1×10 -7 Torr of pressure with Al Kα (1486.6eV) source. The obtained binding energies are charge corrected relative to the adventitious carbon (C1s) peak at 284.6 eV.

Raman spectral analysis was examined on a Horiba Jobin Yvon HR800 Raman spectrometer with a con-focal microscope using a liquid N2-cooled charge-coupled device (CCD) detector and a 632 nm of Ar+ ion laser.

The Micromeritics Autochem 2910 instrument was used to measure acidic sites present on the catalyst surface by NH3-TPD experiments. The catalyst was degassed to 573 K in a He stream before TPD analysis and 5% NH3 balanced He gas was passed over the catalyst for 45 min, followed by a helium flush to remove physisorbed NH3 gas. Desorption gas was continuously monitored using a TCD detector and the area under the peak was estimated. The chemisorptions of NH3was measured by flowing helium at a flow rate of 20 mLmin-1 at a heating rate of 10°Cmin-1 from 323 K to 1073 K of temperature.