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PdCuCeO- TPAB: A new catalytic system for quasi-heterogeneous Suzuki-Miyaura cross-coupling reaction under ligand-free conditions in water.

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Catalyst characterisation

X-Ray diffraction (XRD)

Powder X-ray diffraction (XRD) patterns of the samples were recorded on a Bruker D8 Advance diffractometer, equipped with a XRK900 *in situ* cell and a Cu K α source ($\lambda = 1.5406$ Å). The XRD patterns of 2 θ from 10 to 90 degrees were recorded at a scan rate of 0.5 °/min. The average crystallite size (*D*) and lattice strain (ε) values of the substituted ceria materials were determined from Williamson-Hall (W-H) plots and equation (1). The XRD pattern for all samples (PdCeO, CuCeO and PdCuCeO) correspond only to the ceria phase with the fluorite structure (JCPDS 34-0394).

$$\beta_{hkl}\cos\theta = \frac{K\lambda}{D} + 4\varepsilon\sin\theta \tag{1}$$



Figure SI 1: XRD patterns of the as-prepared samples

TEM/SEM

SEM images and EDX data were obtained with a Jeol JSM-6100 scanning microscope using Bruker signal processing unit detector. The analysis was performed at random points along the surface of the catalyst. The samples were first mounted on aluminium stubs using a double-sided carbon tape; they were

then coated with gold using a Polaron E5100 coating unit. For TEM analysis, the samples were viewed on Joel JEM-1010 Electron Microscope. For high resolution TEM (HR-TEM) and scanning electron microscopy (STEM) analysis, the samples were viewed on Joel JEM-2100 Electron Microscope and the images captured were analysed using iTEM software. The powder samples were ultrasonically dispersed in ethanol and supported on a perforated carbon film mounted on a copper grid prior to analysis.



Figure SI 2: Light microscopy (A) SEM (B) TEM (C) and HR-TEM (D) analysis of the PdCuCeO catalyst



Figure SI 3: SEM-EDX image of PdCuCeO

Thermogravimetric analysis (TGA)

TGA analysis was conducted on a TA SDT Q600 instrument under nitrogen flowing at 50 ml/min and at a temperature ramp rate of 10 $^{\circ}$ C/min from room temperature up to 1000 $^{\circ}$ C with ca. 10 mg of sample.



Figure SI 4: TGA analysis of the PdCuCeO catalyst