Supporting informations:

Scheme S1 Synthesis pathway for the formation of Ce-complex intercalated LDH

Possible mechanistic pathway

Scheme S2 represents the possible mechanistic pathway for alcohol oxidation (ex- benzyl alcohol). Reaction proceeds with oxidative addition of mol.O₂ to Ce-centre to form an oxo bridge complex which is unstable followed by addition of benzyl alcohol. Subsequent step involves the reductive elimination to form benzaldehyde.
**Scheme S2** Plausible mechanistic pathway for benzyl alcohol oxidation

**Scanning electron microscope studies**

Figure S1 shows scanning electron micrographs of each of the catalysts prior to reaction. The unmodified LDH in Figure S1(a) has a conventional large-hexagonal plate like morphology with sharp edges. But in case of complex intercalated LDH, a slight defective image indicating flexibility of the host layer and intercalation of complex in the ion exchange process.
**Fig. S1** SEM images of (a) Zn/Al-LDH (b) LDH/Ce-complex

**Thermogravimetric analysis**

Figure S2 shows the TGA curves of Zn/Al-NO$_3$ (solid line) and LDH/Ce-complex (dotted line). Generally, four steps are observed in the thermal evolution of LDH.$^1$ Desorption of physically adsorbed water, removal of interlayer structural water, dehydroxylation of the brucite-like sheets, and decomposition of the interlayer anions. The first weight loss for Zn/Al-NO$_3$ occurs from room temperature to 125 °C which is due to the removal of crystallization water (7%). A mass loss of 28.4% takes place in the temperature range 200-500 °C, attributed to decomposition of the brucite-like layer and removal of interlayer anions. A second step is observed from 175 to 230 °C, assigned to partial dehydroxylation of the double hydroxide layers. Complete dehydroxylation of the lattice takes place from 390 to 590 °C, accompanied by elimination/decomposition of the organic anion.
Fig. S2 TGA curves of Zn/Al-LDH (——) and LDH/Ce complex (---)

$^{13}$C CP MAS NMR spectra

Fig. S3 $^{13}$C CP MAS NMR spectra of Ce-complex
References