

# Room Temperature Reduction of Ceria

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**Tags:** DRIFTS CO room temperature

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## Goal :

To observe the reduction of ceria at different pressures using carbon monoxide (1%)

## Procedure :

All data was measured using  $2\text{ cm}^{-1}$  resolution.

Initial background is run in Ar at room temperature - LC002.0

Five spectra are recorded to view the spectra - LC002.0000-0004 (Recorded in Ar)

The CO line is checked for any carbonyl/metal impurities LC002.0005-0012

The sample is then heated to  $550\text{--}600\text{ }^{\circ}\text{C}$  for 30 mins after flushing the cell with Ar - LC002.0013-0029

Further spectra are recorded at high temperature to see the effect of heating - LC002.0013-0029

During cooling spectra are recorded to evaluate any changes that may occur - LC002.0030-0044

At  $\sim 30\text{ }^{\circ}\text{C}$  carbon monoxide is introduced at 200 ml/min (1 atm)

Spectra are recorded for 30 mins under these conditions - LC002.0045-0061

The gas line is then switched to Ar (50 ml/min) to remove all CO from the DRIFTS cell - LC002.0062-0063

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The same sample is then cleaned at  $550\text{ }^{\circ}\text{C}$  -  $600\text{ }^{\circ}\text{C}$  for an hour in order to clean the surface - LC002.0064-0093

The sample is then cleaned and allowed to cool to  $40\text{ }^{\circ}\text{C}$  in an Ar atmosphere - LC002.0094-0104

Change to CO 1%, 200 ml/min - LC002.0105-0175

The following experiments were conducted with a closed outlet, and the pressure was increased to 2 bar

LC002.0176-0179

increase CO pressure to 3 bar - LC002.0180-0183

increase CO to 4 bar - LC002.0184-0186

increase to 4.4 bar - LC002.0187-0195

The sample was then subsequently heated in a CO atmosphere at high pressures

CO batch 3 bar, heat to 300 °C - LC002.0196-0201

increase temperature to 500 °C for 10 minutes at 3 bar of CO - LC002.0202-0209

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The sample is then cool down to room temperature, spectra are recorded to measure the change - LC002.0210-0224

stop CO dosing, start dosing Ar - LC002.0225-0228

start dosing O<sub>2</sub> (50 ml/min) - LC002.0229-0234

The sample is then heated to 100 °C to oxidise and try and clean the surface - LC002.0235-0238

Restart CO dosing, using a batch experiment with 3 bar, until end, to look for any reduction - LC002.0239-0259

cool down to room temperature, refer to 104? refer to 242? get rid of CO gas phase somehow, possible band at 2164 cm<sup>-1</sup> - LC002.0260-550

## Results :

Small band observed a 2164 cm<sup>-1</sup> which is possibly related to reduced ceria, however it remains difficult to identify bands and find a suitable subtraction method.



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