

## Supporting Materials

### Brookite-Supported Highly Stable Gold Catalytic System for CO Oxidation

Wenfu Yan, Bei Chen, Shannon M. Mahurin, Sheng Dai\*, and Steven H.  
Overbury

Chemical Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

Fax: 865-576-5235; Email: [dais@ornl.gov](mailto:dais@ornl.gov)

#### 1. Sonication synthesis of anatase<sup>1</sup>

In a typical synthesis, 100 mL of deionized water was sonicated by employing a direct immersion titanium horn (Sonics and Materials, VCX-750, 20 kHz, and starting power 100 W) followed by the injection of 10 mL of tetraisopropyltitanate into a glass beaker. The mixture was further sonicated continuously for 1 hour and the sonication was conducted without cooling. The white precipitates were separated by centrifugation and washed three times with deionized water and once with ethanol. The product was dried in a desiccator overnight and was ground into a fine powder before the deposition of gold precursor on its surface.

#### 2 Hydrothermal synthesis of brookite<sup>2</sup>

Typically, NaOH solution (2.0 M) was added to 5 mL titanium tetrachloride with stirring to adjust the pH value of the solution to 10, a basic colloidal solution was formed. The obtained solution was transferred into an autoclave and heated at 200°C for 24 hours. The white precipitates were separated by centrifugation and washed three times with deionized water and once with ethanol. The product was dried at 70°C in air overnight. The product was ground to a fine powder before the deposition of gold precursor on its surface.

### 3 Deposition-precipitation (D-P)

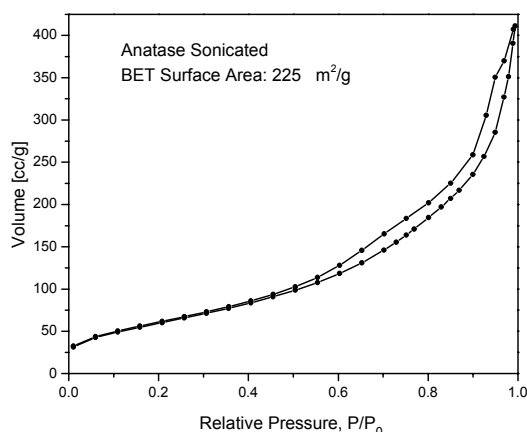
Firstly, 0.3 g of hydrogen tetrachloroaurate (III) trihydrate ( $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ , 99.9+%, Aldrich) was dissolved into 50 mL deionized water. The pH value of the resulting solution was adjusted to 10 with vigorous stirring using a solution of 1.0 M KOH at room temperature. After pH adjustment, the solution was heated at a 60 °C water bath followed by the addition of 1.0 g of  $\text{TiO}_2$  powder. The resulting mixture was continually stirred for 2 hours. Finally, the precipitates were separated by centrifugation and washed three times with deionized water and once with ethanol. The product was dried at 50°C temperature in air overnight to obtain the “as-synthesized” catalyst.

### 4 Characterization methods

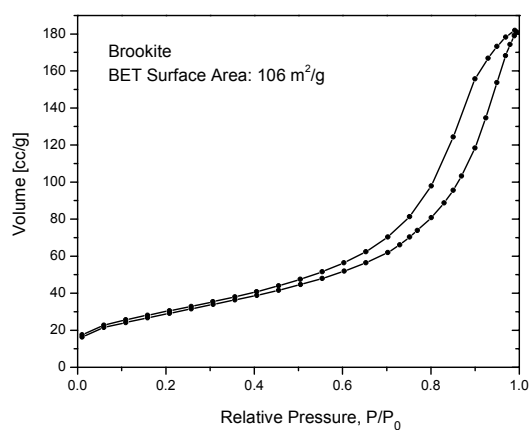
Powder x-ray diffraction (XRD) data were collected via a Siemens D5005 diffractometer with  $\text{CuK}\alpha$  radiation ( $\lambda = 1.5418 \text{ \AA}$ ). Microscopy was carried out on two different microscopes. One was an HITACH HD-2000 STEM operated at 200 kV, which was used to carry out the SEM and routine TEM and Z-contrast microscopy. The other was a VG 603 aberration corrected Z-contrast microscope capable of magnifications up to 50M. Nitrogen gas adsorption measurements (Micromeritics Gemini) were used to measure the surface area and porosity of the titania supports. ICP analysis was performed on a Thermo Jarrell Ash IRIS ICAP spectrometer.

### 5 BET

Anatase

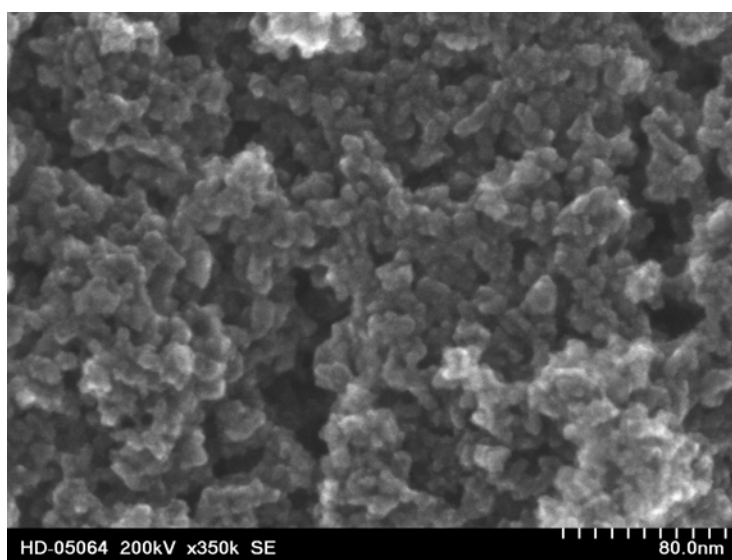


Brookite

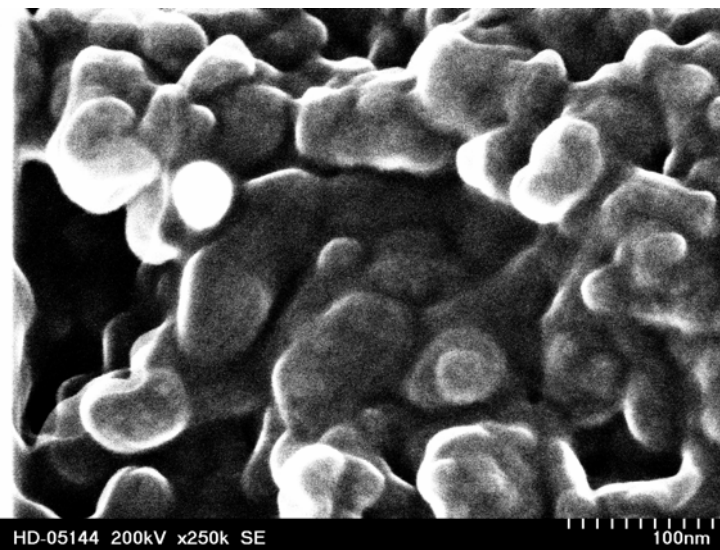


## 6 SEM

Anatase



Brookite



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<sup>1</sup> Huang, W.; Tang, X.; Wang, Y.; Koltypin, Y.; Gedanken, A. *Chem. Commun.* **2000**, 1415.

<sup>2</sup> Zheng, Y.; Shi, E.; Cui, S.; Li, W.; Hu, X. *J. Mater. Sci. Lett.* **2000**, *19*, 1445.