

## Electronic Supporting Information

### **Benzene hydrogenation over alumina-supported nickel nanoparticles prepared by polyol method**

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In this Electronic Supporting Information additional data are given on structure and morphology of Ni/Al<sub>2</sub>O<sub>3</sub> catalysts (XRD patterns, TEM images and EDX analysis).

#### **XRD patterns of the Ni/Al<sub>2</sub>O<sub>3</sub> catalysts**

The X-ray diffraction patterns of the Ni/Al<sub>2</sub>O<sub>3</sub> catalysts were recorded using a Philips X'Pert Pro diffractometer in the 2θ range of 2-95° with a scan speed of 2°/min (see Figure S1). The XRD patterns showed crystallized alumina. All catalysts (except NiEG-05 catalyst) showed a large main band at 2θ = 44.5°, characteristic of metallic nickel phase of *fcc* structure. The peaks at 44.51° and 51.8° can be assigned to (111) and (200) crystalline plane diffraction, respectively. The (111) characteristic peak at 44.5° for NiEG-1 catalyst is almost not detected. The existence of a very weak signal could confirm a very small metal nickel particle in the catalyst. Moreover, the XRD patterns also reveal that there is no mixed oxide phase formed between Ni and Al<sub>2</sub>O<sub>3</sub>.

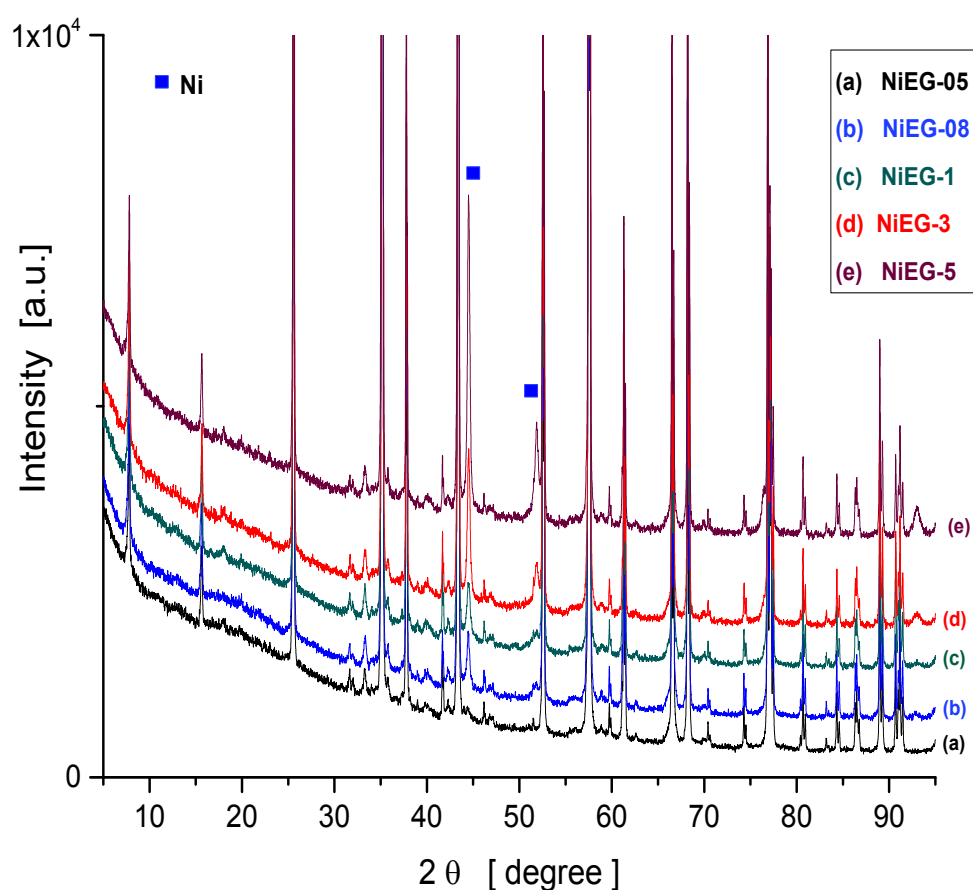


Figure S1. XRD patterns of the Ni/Al<sub>2</sub>O<sub>3</sub> catalysts: (a) NiEG-05; (b) NiEG-08; (c) NiEG-1; (d) NiEG-3 and (e) NiEG-5.

### TEM images and EDX analysis of NiEG-1 catalyst

TEM images and EDX analysis were recorded for NiEG-1 and NiEG-3 catalysts. The typical results are reported in Figures S2 and S3. The nickel particles are well evidenced on the Al<sub>2</sub>O<sub>3</sub> surface. The average particles size was about 14.2 and 18.0 nm for NiEG-1 and NiEG-3 respectively. These results are in good agreement with crystallite size value estimated by XRD. The EDX analysis indicated the presence of metallic nickel on the alumina support.

In this study, the metal loading of the Ni/Al<sub>2</sub>O<sub>3</sub> catalysts was determined by Absorption atomic spectrometry (see Experimental section). The EDX analysis was used only to check the presence of the nickel particles on the support surface. In our study, the EDX analysis of sample NiEG-1 at different points was carried out. The obtained results are reported in Figure S2. For example, positions A and B exhibit 0.5%Ni and 2.4%Ni respectively. Position D is rich in nickel, and it is about 4.6%Ni. In contrast, no peak of nickel was detected in position E, indicating the low Ni content in this position.

In conclusion, the metal nickel loading taken from different areas (A, B, C, D and E) was found in the range of 0.1-4.6 %Ni. Metal catalyst content can be determined using the formula shown below:

$$\%Ni = \sum_{j=1}^N \frac{(\%Ni)_j}{N}$$

where (%Ni)<sub>j</sub> is the percentage of nickel in point j, and N is the total number of points.

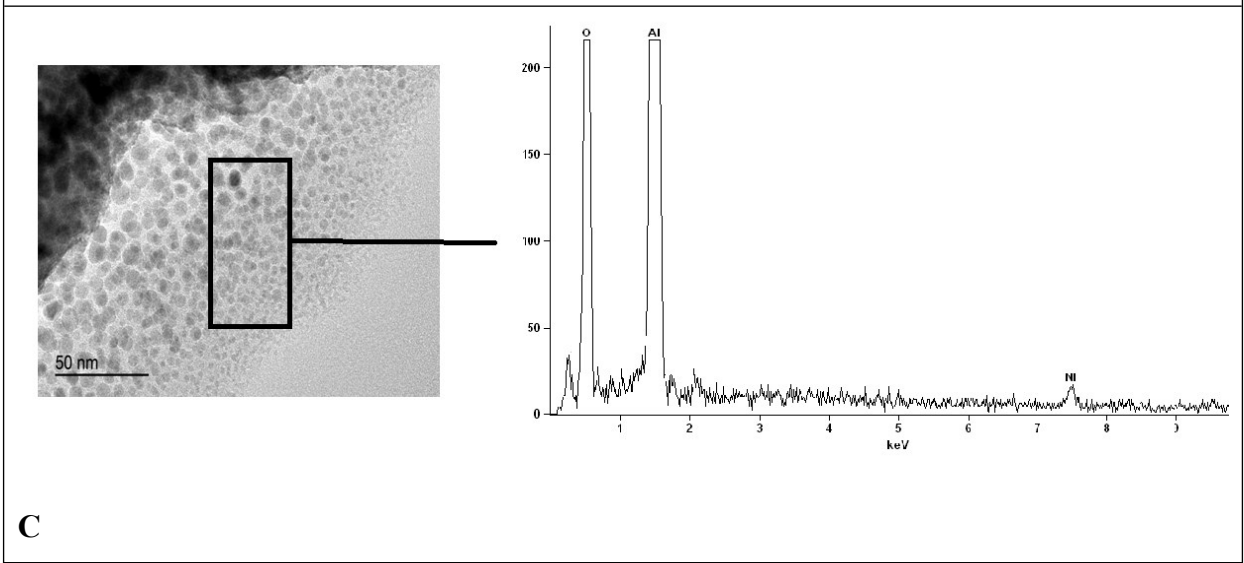
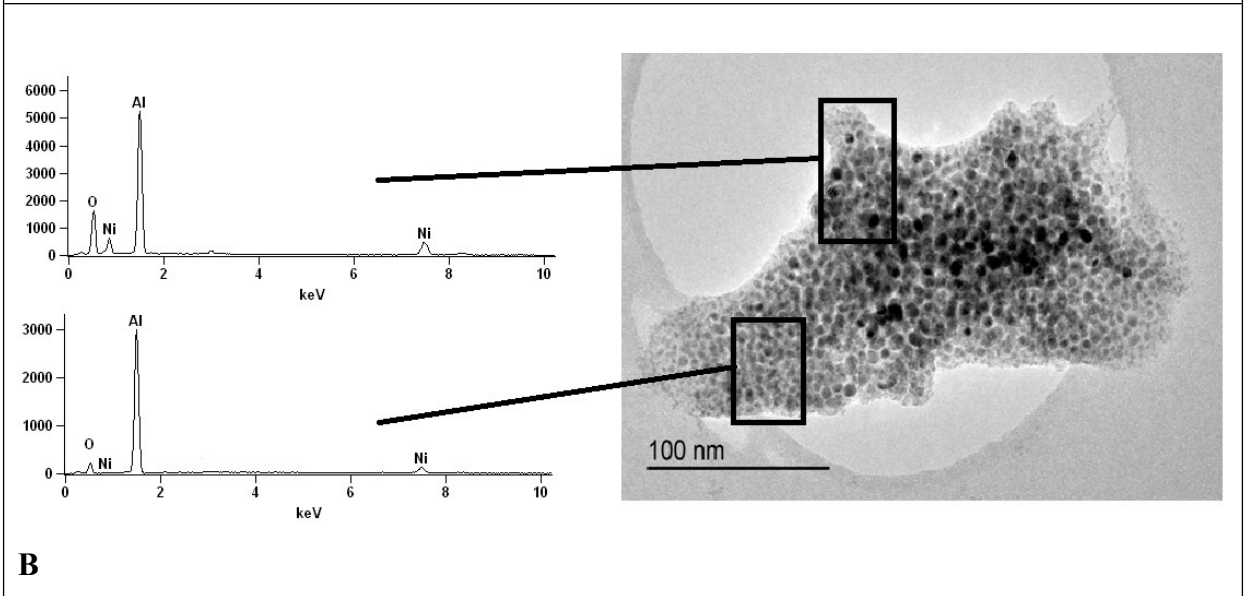
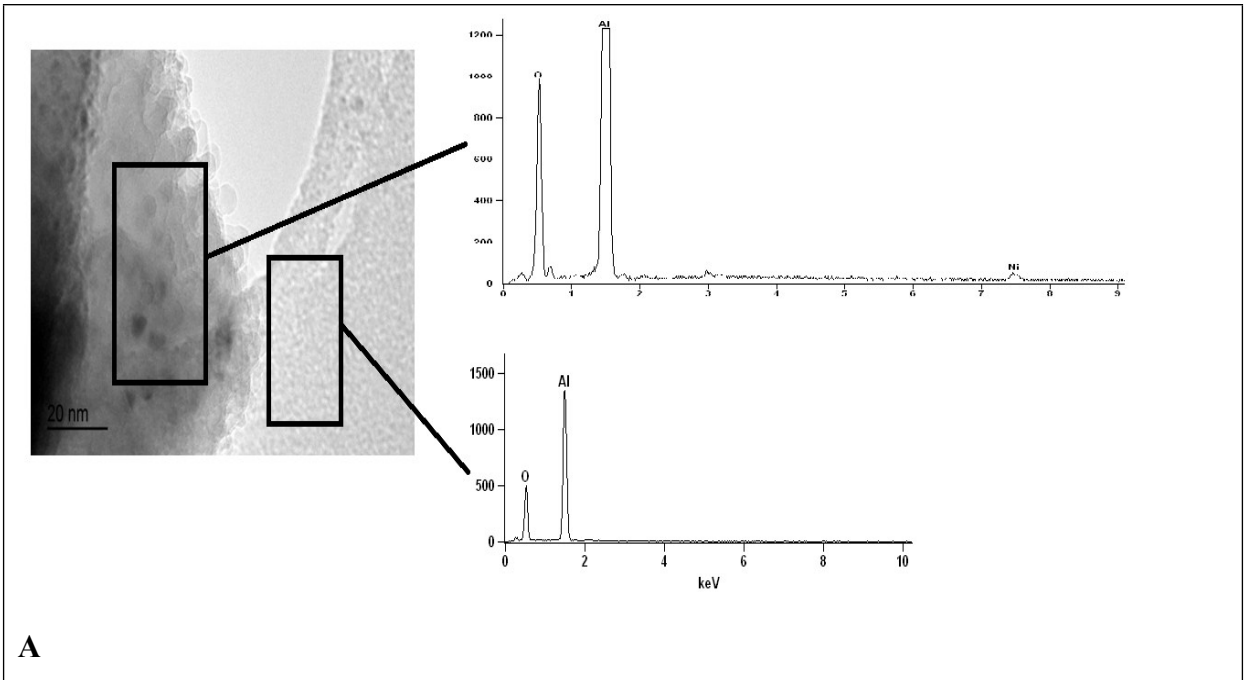
For example, the nickel loading at points A, C, D and E is calculated by the formula shown below:

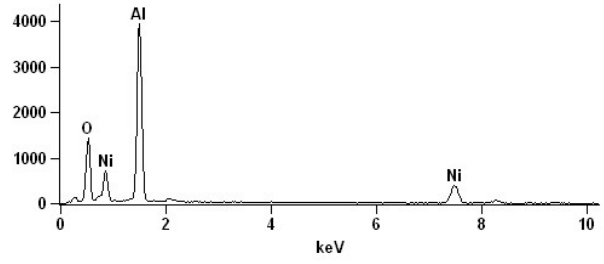
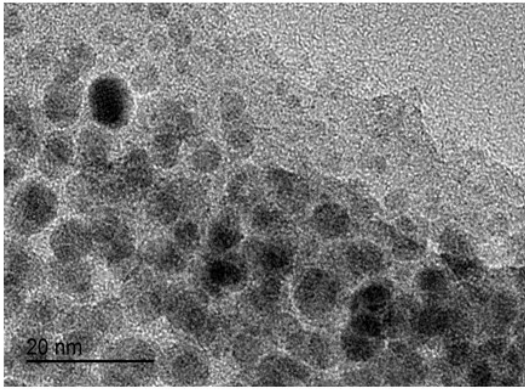
$$\%Ni = \sum_{j=1}^5 (\%Ni)_j = \sum_{j=1}^5 (0.5 + 0.1 + 0.7 + 4.6 + 0.07)/5 = 1.19$$

The nickel loading at points A, B, C, D and E is calculated as follows:

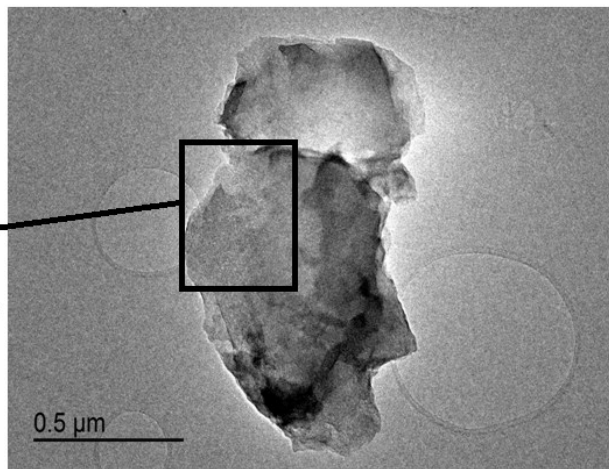
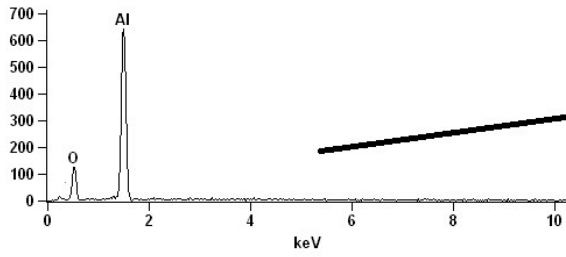
$$\%Ni = \sum_{j=1}^7 (\%Ni)_j = \sum_{j=1}^7 (0.5 + 0.1 + 2.4 + 3.8 + 0.7 + 4.6 + 0.07)/5 = 1.73$$

Based on these values obtained; one can say that this formula remains an approximation, and does not reflect the exact determination of the amount of nickel in the catalysts. Thus, in the present work, the metal content in the Ni/Al<sub>2</sub>O<sub>3</sub> catalysts was determined by Absorption atomic spectrometry.





**D**



**E**

Figure S2. TEM images and EDX analysis of the NiEG-1 catalyst.

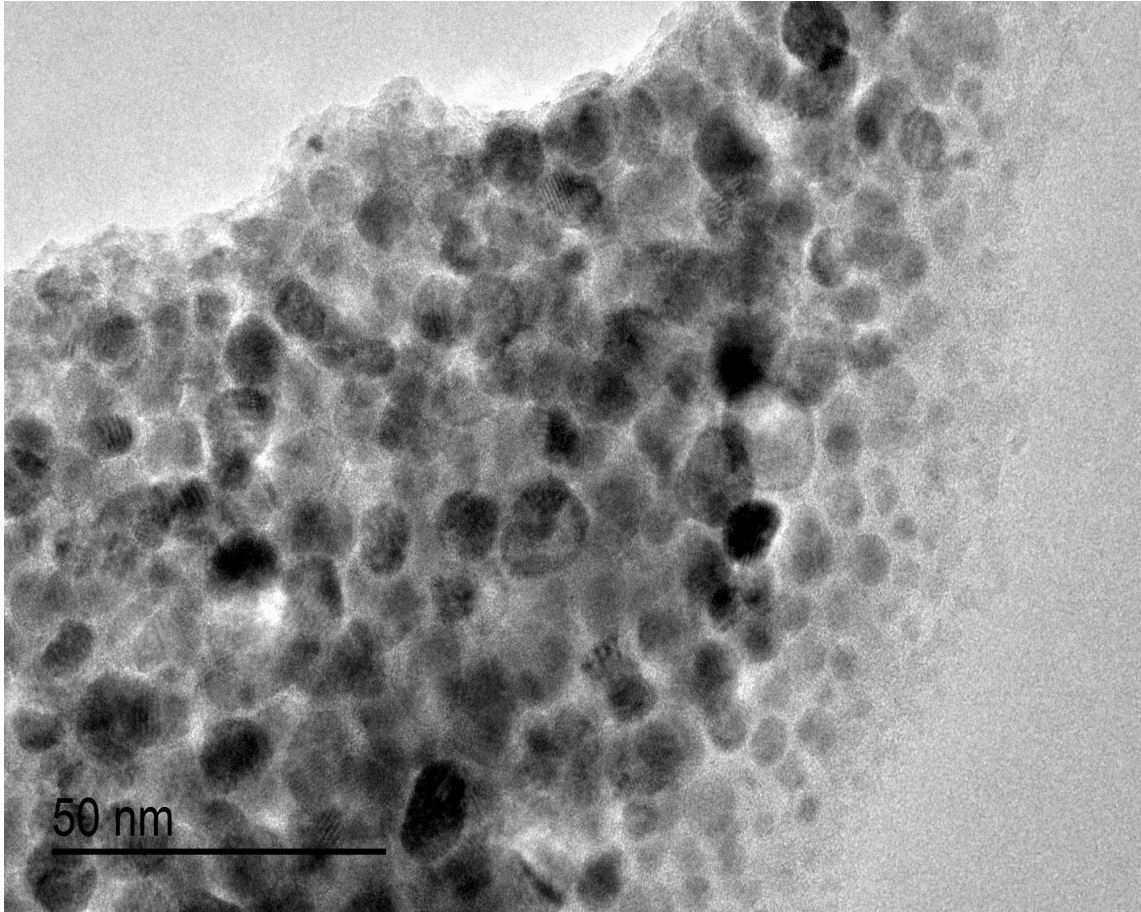


Figure S3. TEM image of NiEG-3 catalyst.