MFI zeolite-supported Ru nanoparticles for efficient conversion of glutamic acid to 2-pyrrolidone

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Figure Captions

Figure S1 XRD for Ru/MFI prepared using $RuCl_3$ solutions with various pH values. The values indicate the pH of the $RuCl_3$ solution after adding the NH_4OH solution for catalyst preparation. The pH of the initial $RuCl_3$ solution was 1.8. The XRD for the MFI support is labeled "MFI". fcc (face-centered cubic) Ru is cited from pdf #01-088-2333 and labeled "Ru".

Figure S2 TEM images of Ru/MFI prepared using $RuCl_3$ solutions with various pH values. The values in the upper corners in the TEM images and Ru particle diameter distributions indicate the pH of the $RuCl_3$ solution after adding the NH_4OH solution for catalyst preparation. The pH of the initial $RuCl_3$ solution was 1.8. The values at the centers of the Ru particle diameter distributions show the average Ru particle diameter.

Figure S3 TEM images of Ru catalysts impregnated in pH-adjusted $RuCl_3$ solution. The values at the centers of the Ru particle diameter distributions show the average Ru particle diameter.

Figure S4 TEM images of Ru/MFI and Ru/Al_2O_3 prepared by ion-exchange (ie) and impregnation (imp). The values at the centers of the Ru particle diameter distributions show the average Ru particle diameter.

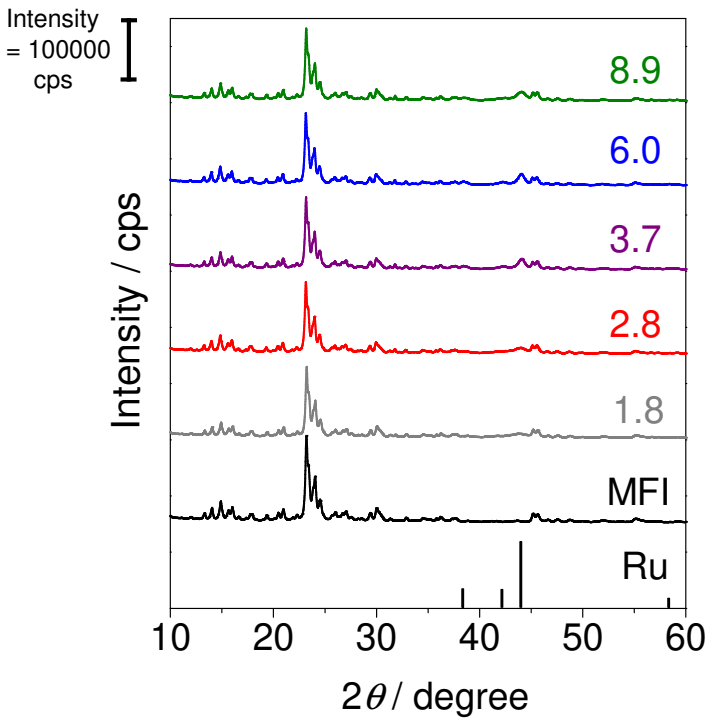
Intensity
= 100000
cps
8.9
6.0
3.7
2.8
1.8
MFI
Ru
Intensity / cps
10
20
30
40
50
60
2θ / degree

Figure S1

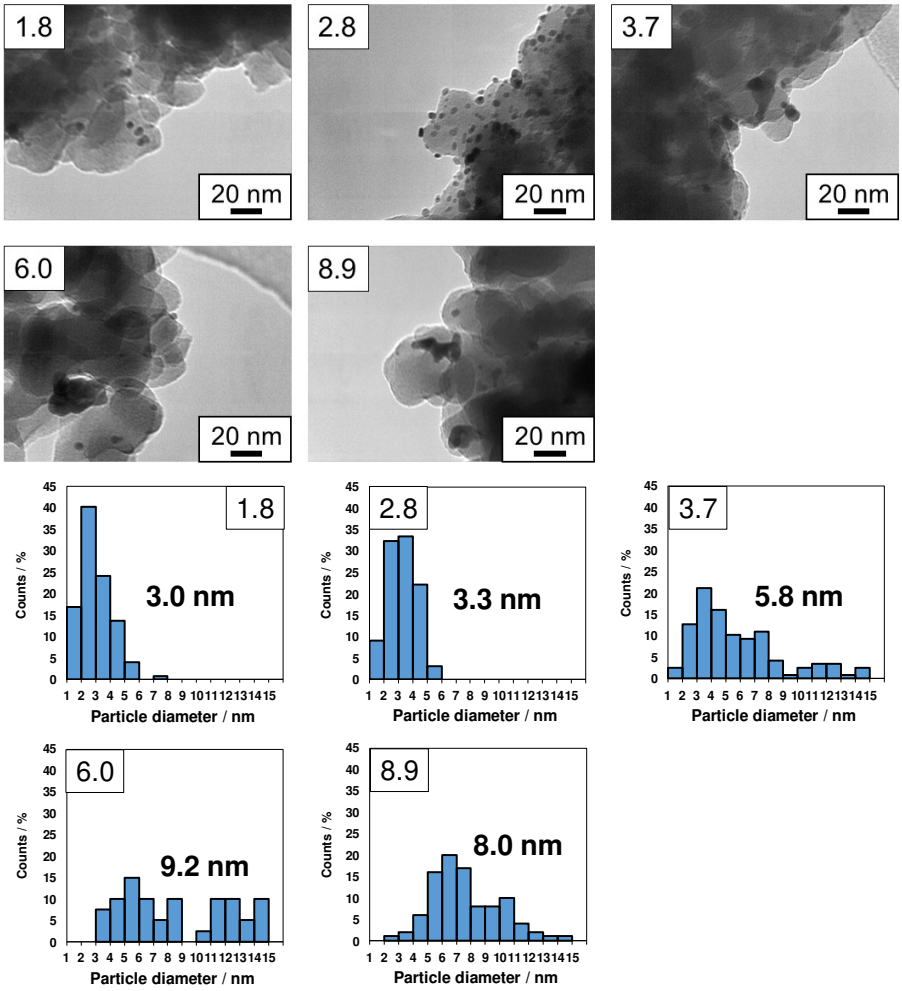
1.8
20 nm
2.8
20 nm
3.7
20 nm
6.0
20 nm
8.9
20 nm
1.8
3.0 nm
2.8
3.3 nm
3.7
5.8 nm
6.0
9.2 nm
8.9
8.0 nm
Counts / %
Particle diameter / nm

Figure S2

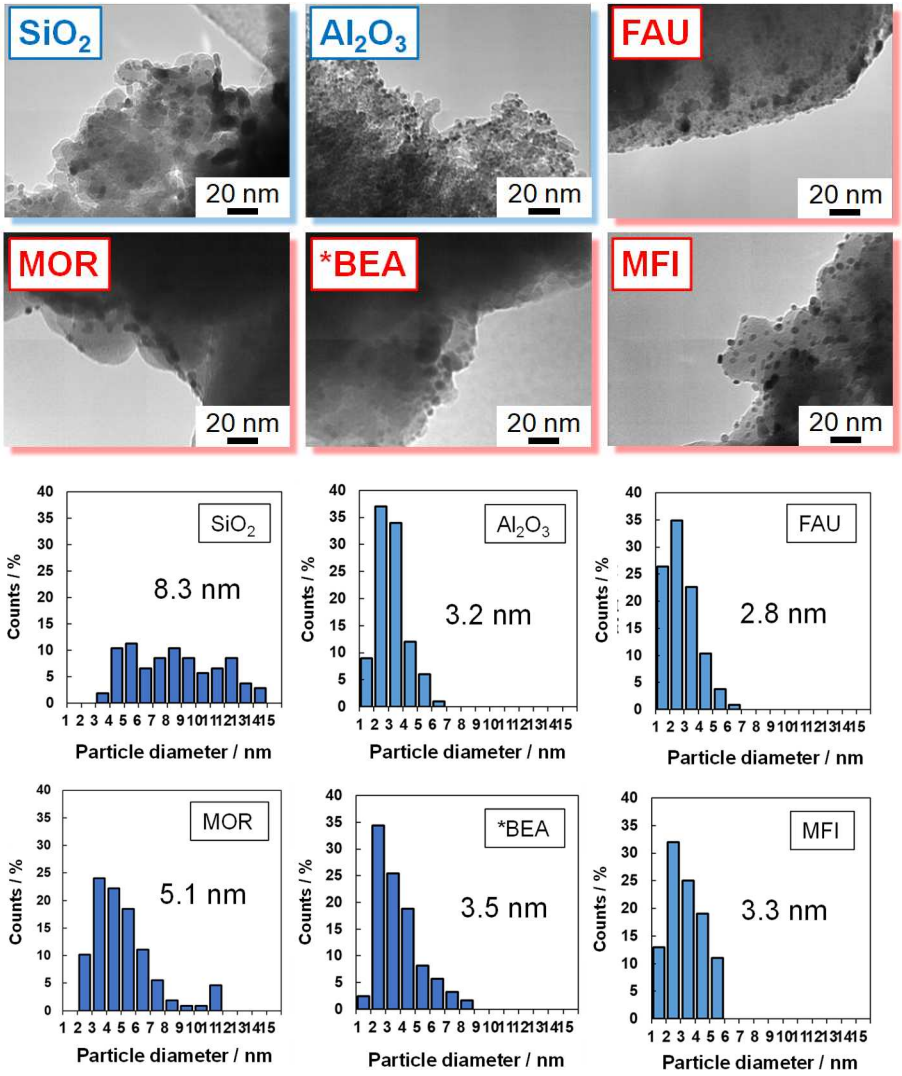
SiO2
Al2O3
FAU
MOR
*BEA
MFI
20 nm
Counts / %
Particle diameter / nm
8.3 nm
3.2 nm
2.8 nm
5.1 nm
3.5 nm
3.3 nm

Figure S3

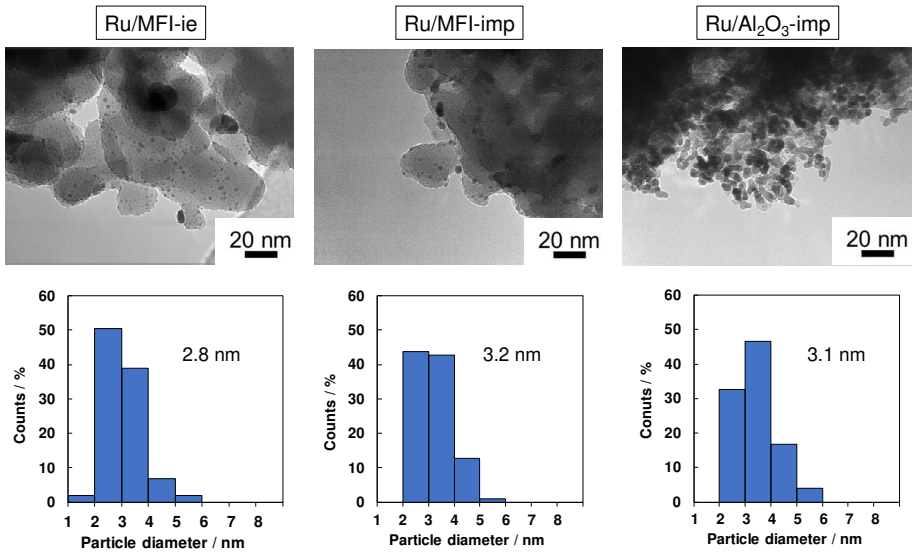
Ru/MFI-ie
Ru/MFI-imp
Ru/Al2O3-imp
20 nm
20 nm
20 nm
2.8 nm
3.2 nm
3.1 nm
Counts / %
Particle diameter / nm

Figure S4