Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Electronic Supplementary Information

Amine-fleshed gold nanoparticles encapsulated in silica nanospheres highly active for catalytic decomposition of formic acid

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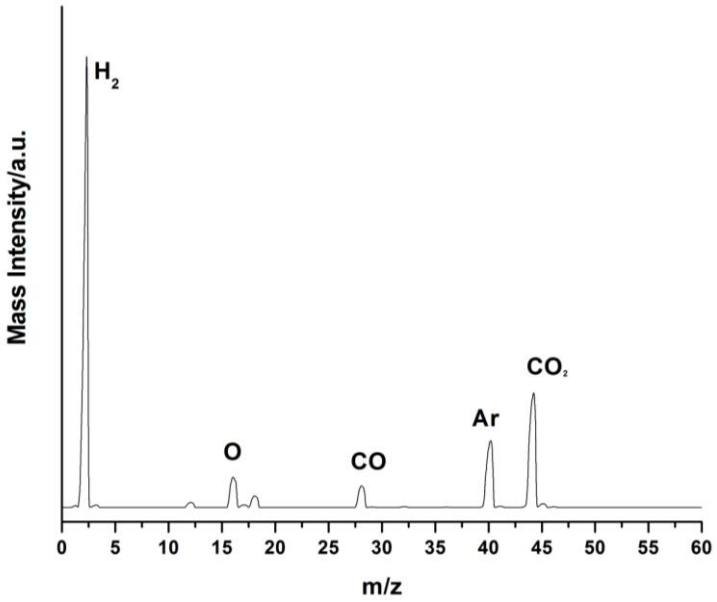

Fig. S1. Mass spectral profile for physical mixture of H_2 and CO_2 (1:1) as a reference gas sample.

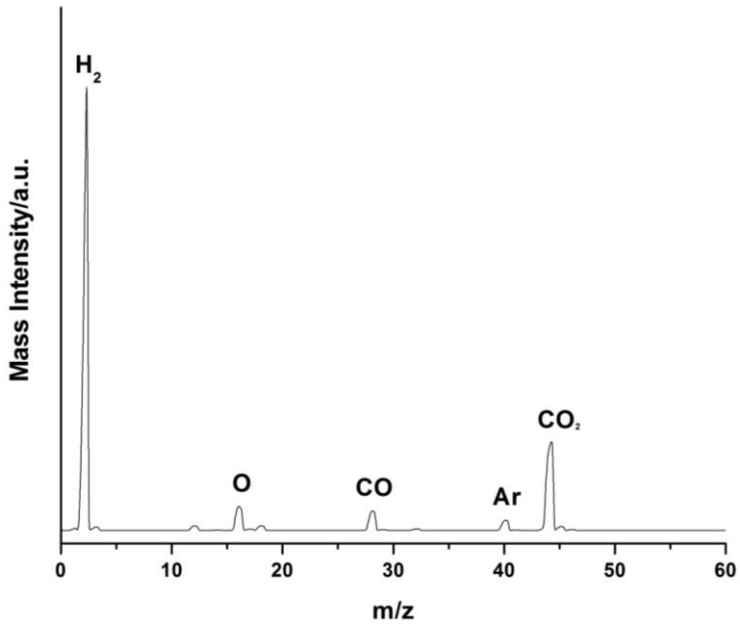

Fig. S2. Mass spectral profile of the released gas from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of Au@SiO_2_AP catalyst (60 mg) at 90°C.

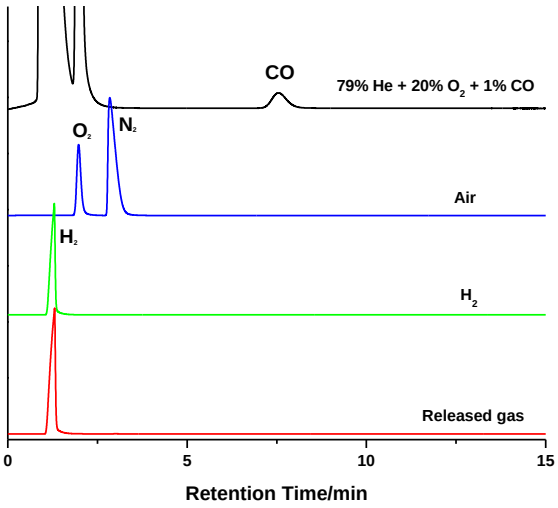

Fig. S3. Gas chromatograms of H_2, air and CO as reference gases and the released gas from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of Au@SiO_2_AP catalyst (60 mg) at 90°C, showing the presence of H_2 and absence of CO in the generated gas.

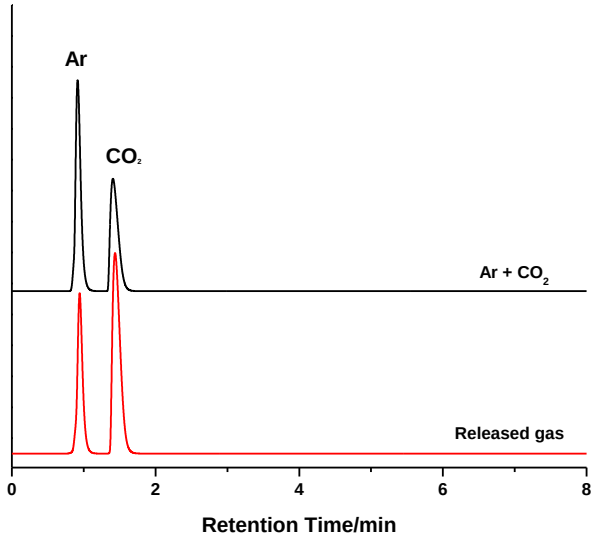

Fig. S4. Gas chromatograms of generated gas from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of Au@SiO_2_AP catalyst (60 mg) at 90°C, showing the presence of CO_2 in the generated gas.

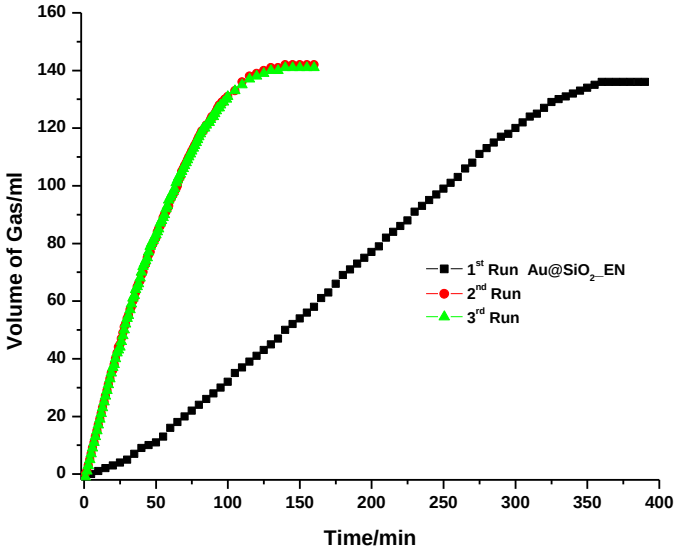

Fig. S5. Time-course plots for hydrogen generation from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of Au@SiO_2_EN catalyst (60 mg) at 90°C.

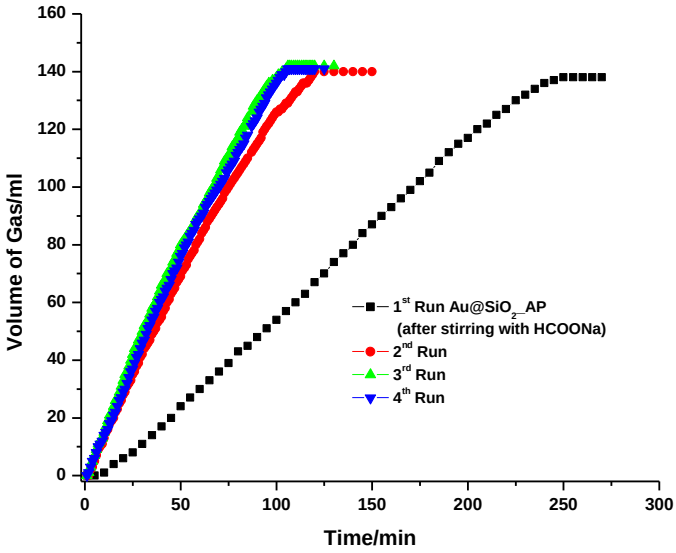

Fig. S6. Time-course plots for hydrogen generation from the aqueous solution of formic acid (3.0 M) in the presence of Au@SiO_2_AP (60 mg) after stirring with the aqueous solution (1.0 mL) of sodium formate (1.0 M) for 240 min at 90°C.

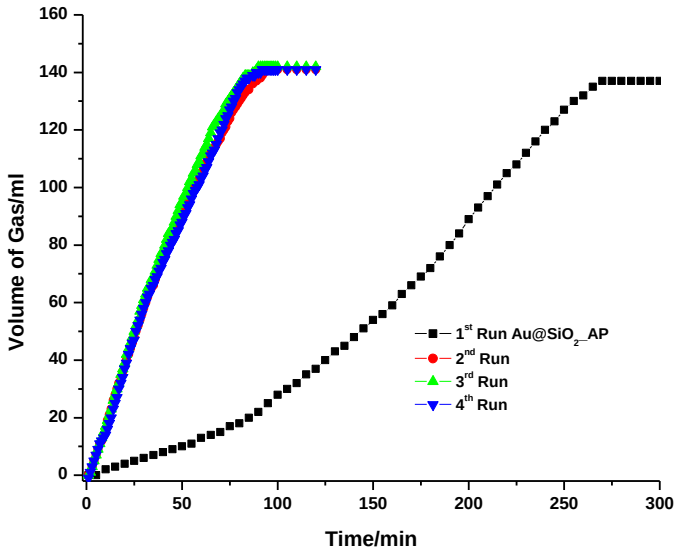

Fig. S7. Time-course plots for hydrogen generation from the aqueous solution (1.0 mL) of formic acid (3.0 M) in the presence of Au@SiO_2_AP catalyst (60 mg) at 90°C.

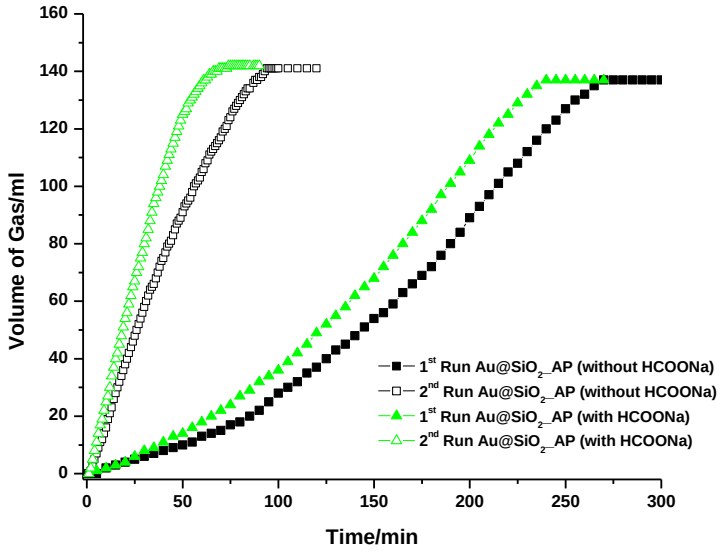

Fig. S8. Time-course plots for hydrogen generation from the aqueous solution (1.0 mL) of formic acid (3.0 M) in the presence of Au@SiO_2_AP (60 mg) with and without sodium formate (1.0 M).

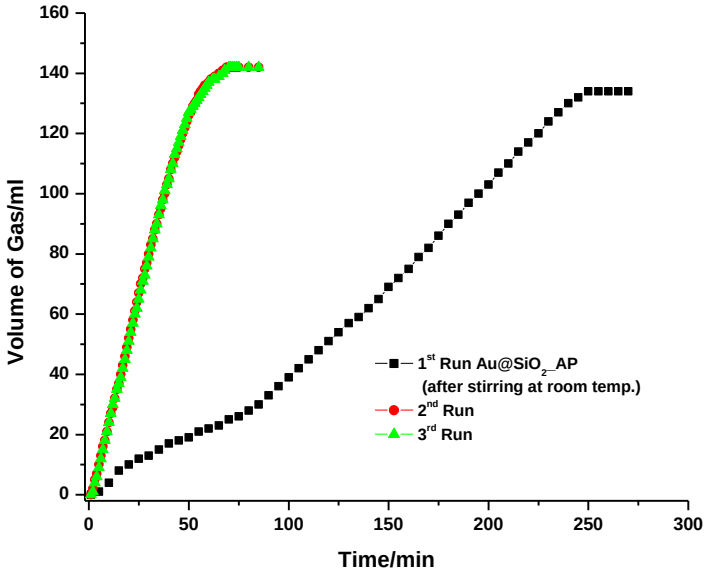

Fig. S9. Time-course plots for hydrogen generation from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of $Au@SiO_2$_AP catalyst (60 mg) after stirring for 240 min at room temperature.

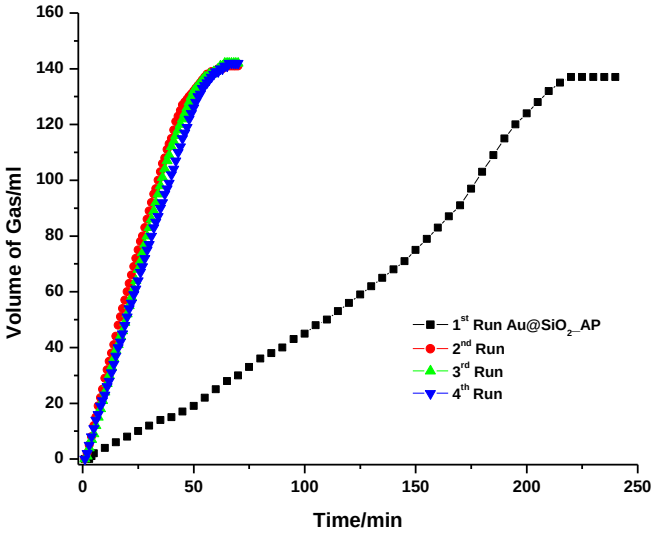

Fig. S10. Time-course plots for hydrogen generation from the aqueous solution (1.0 mL) of formic acid (3.0 M) and sodium formate (1.0 M) in the presence of $Au@SiO_2$_AP catalyst (prepared by using hydrazine as the reducing agent) (60 mg).

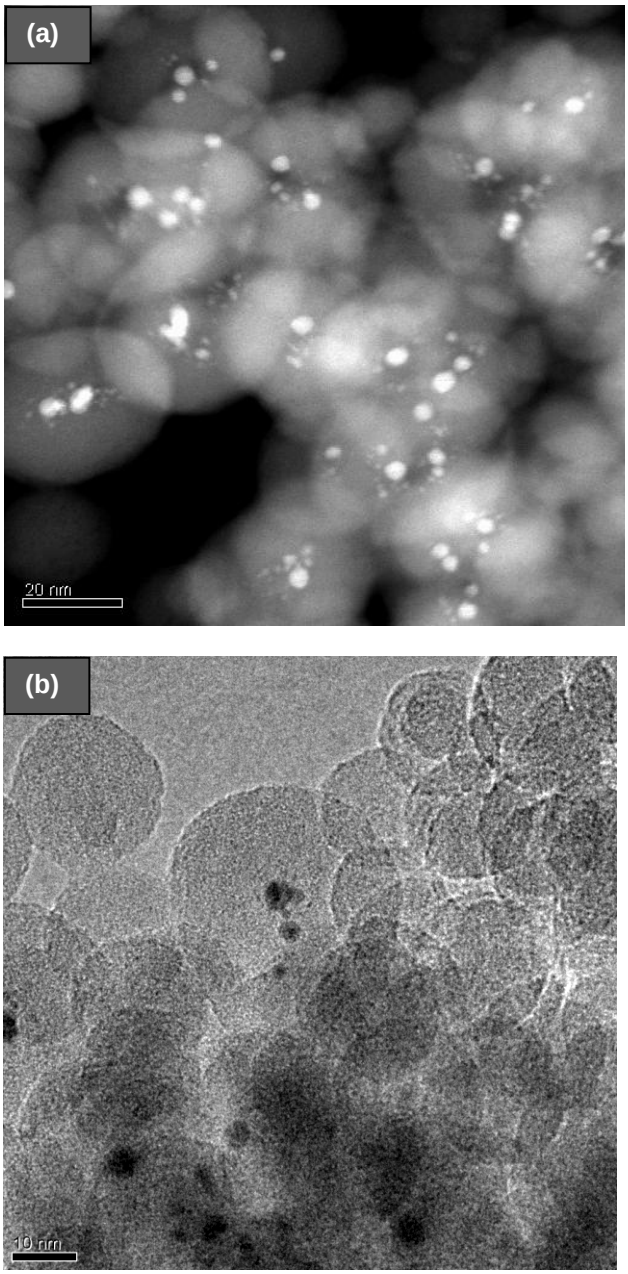

Fig. S11. Representative HAADF-STEM image (a) and TEM image (b) of Au@SiO_2 before catalytic reaction.

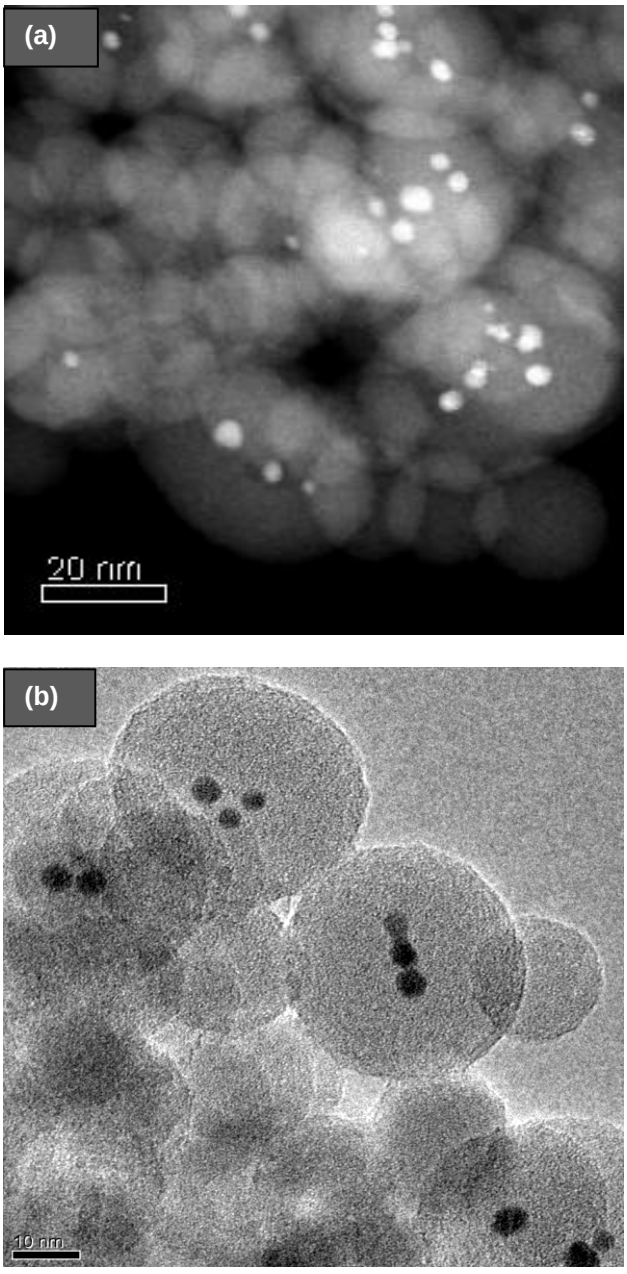

Fig. S12. Representative HAADF-STEM image (a) and TEM image (b) of $Au@SiO_2$ after catalytic reaction.

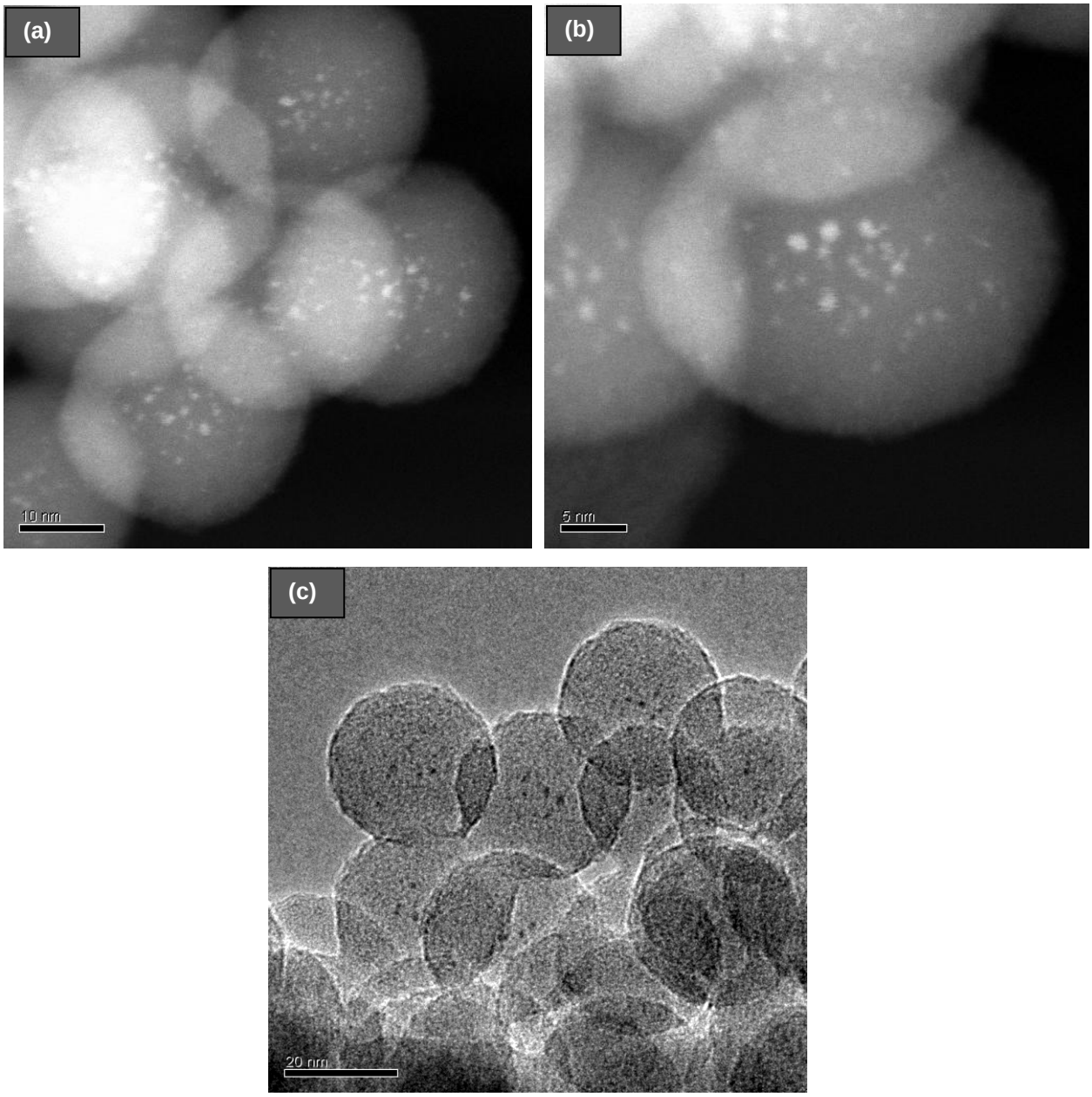

Fig. S13. Representative HAADF-STEM images (a,b) and TEM image (c) of Au@SiO_2_EN before catalytic reaction.

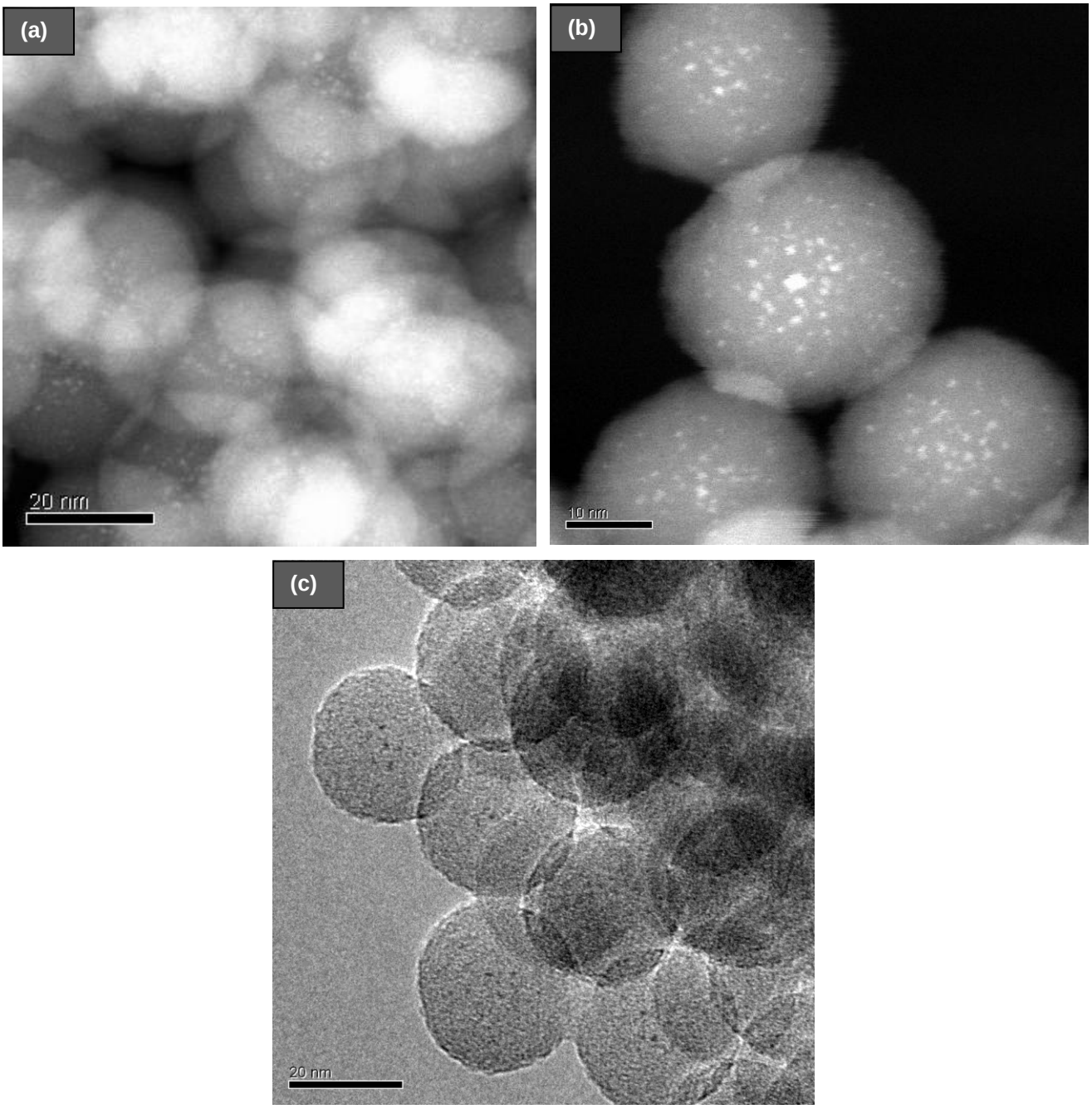

Fig. S14. Representative HAADF-STEM images (a,b) and TEM image (c) of Au@SiO_2_EN after catalytic reaction.

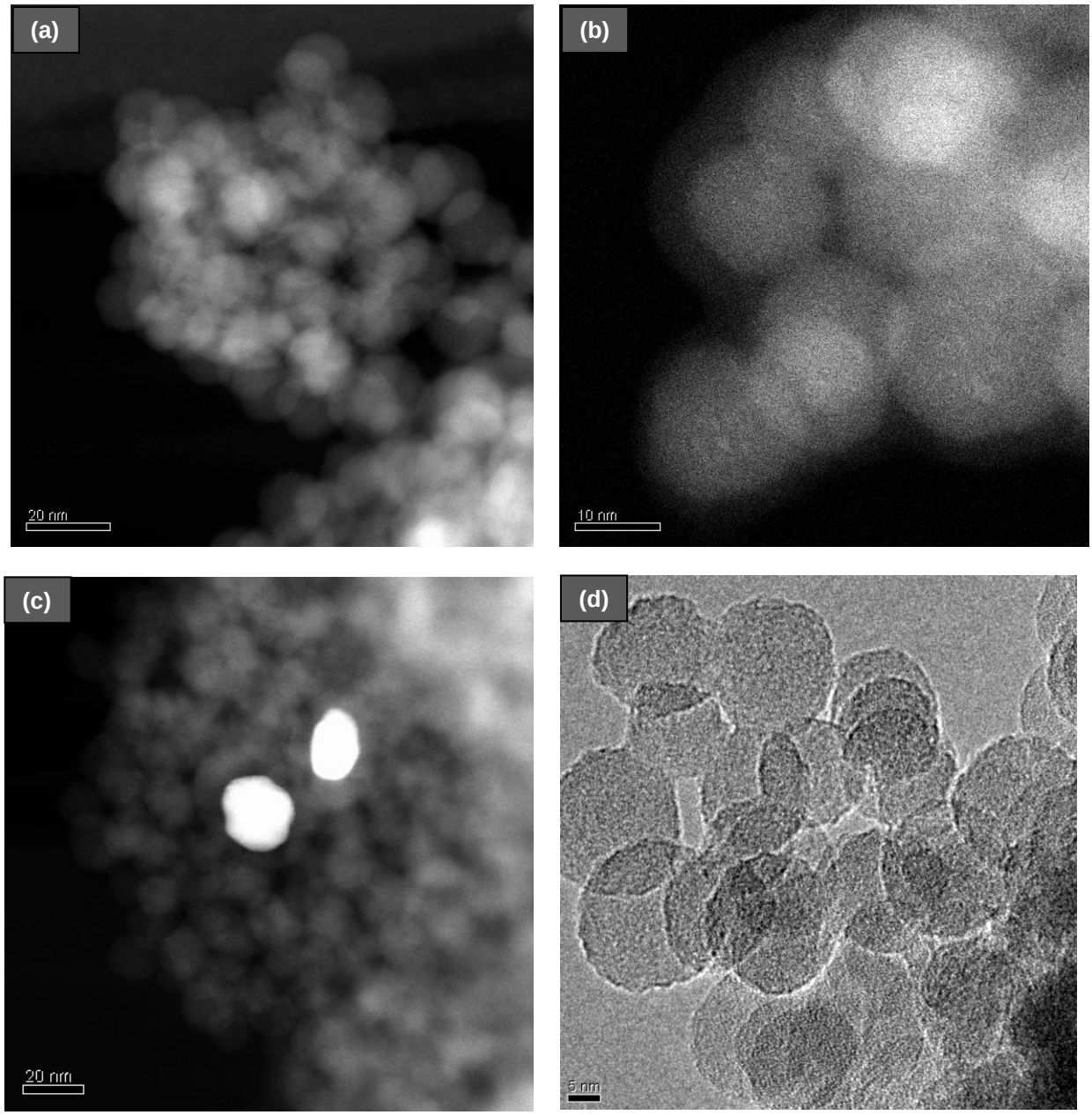

Fig. S15. Representative HAADF-STEM images (a-c) and TEM image (d) of Au@SiO_2_AP before catalytic reaction.

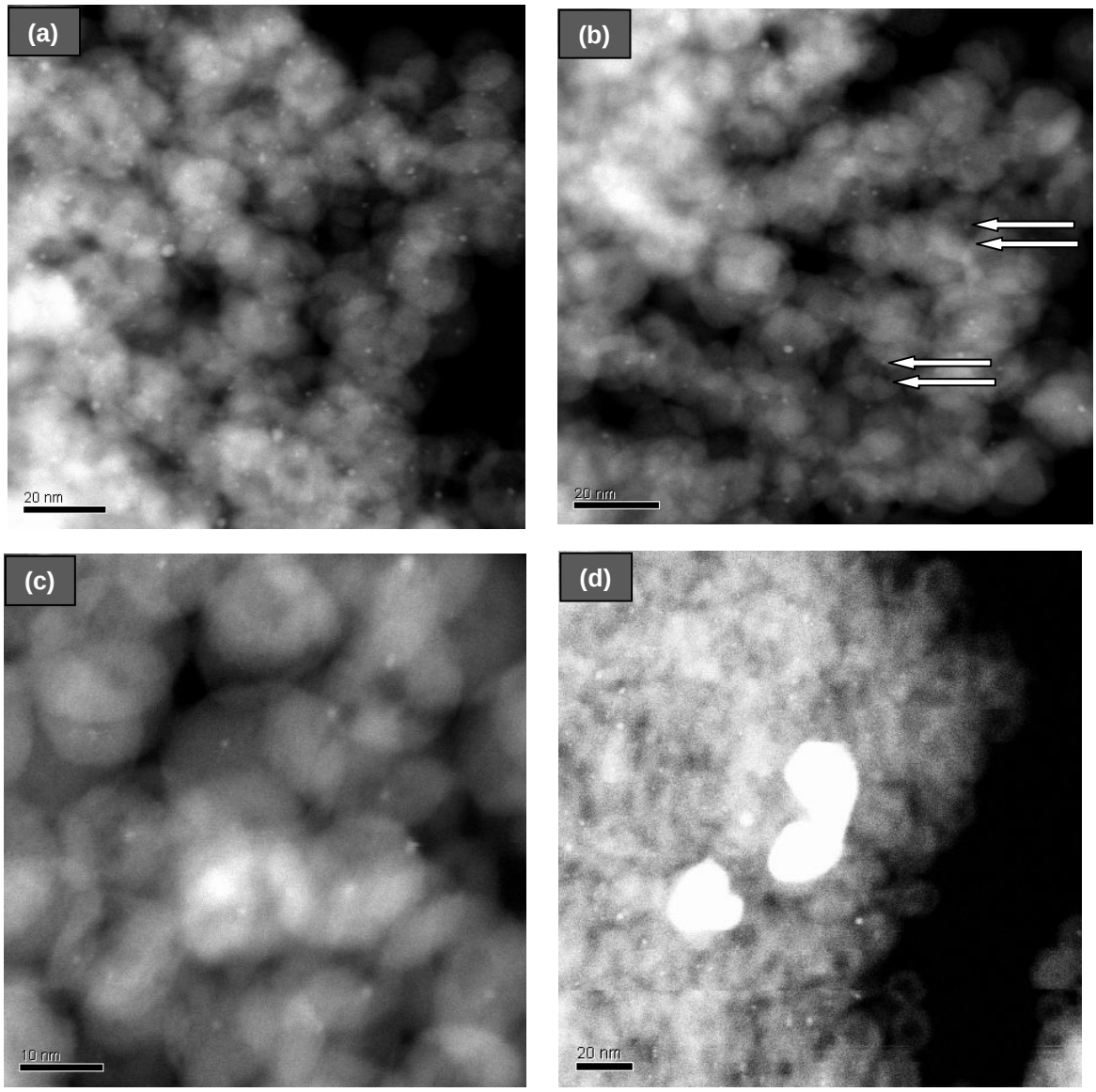

Fig. S16. Representative HAADF-STEM images (a-d) of Au@SiO_2_AP after catalytic reaction.

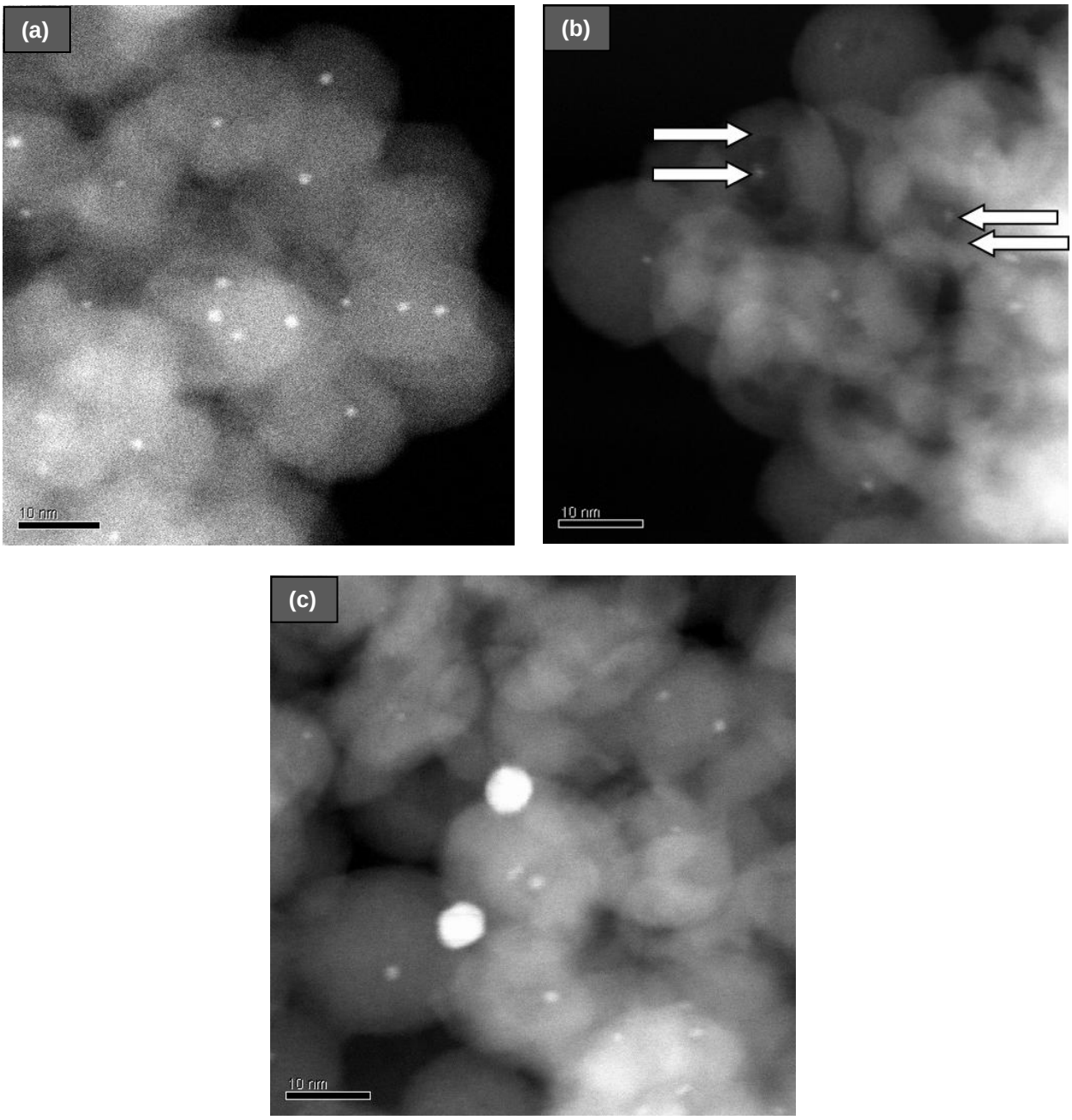

Fig. S17. Representative HAADF-STEM images (a-c) of Au@SiO_2_AP_C before catalytic reaction.

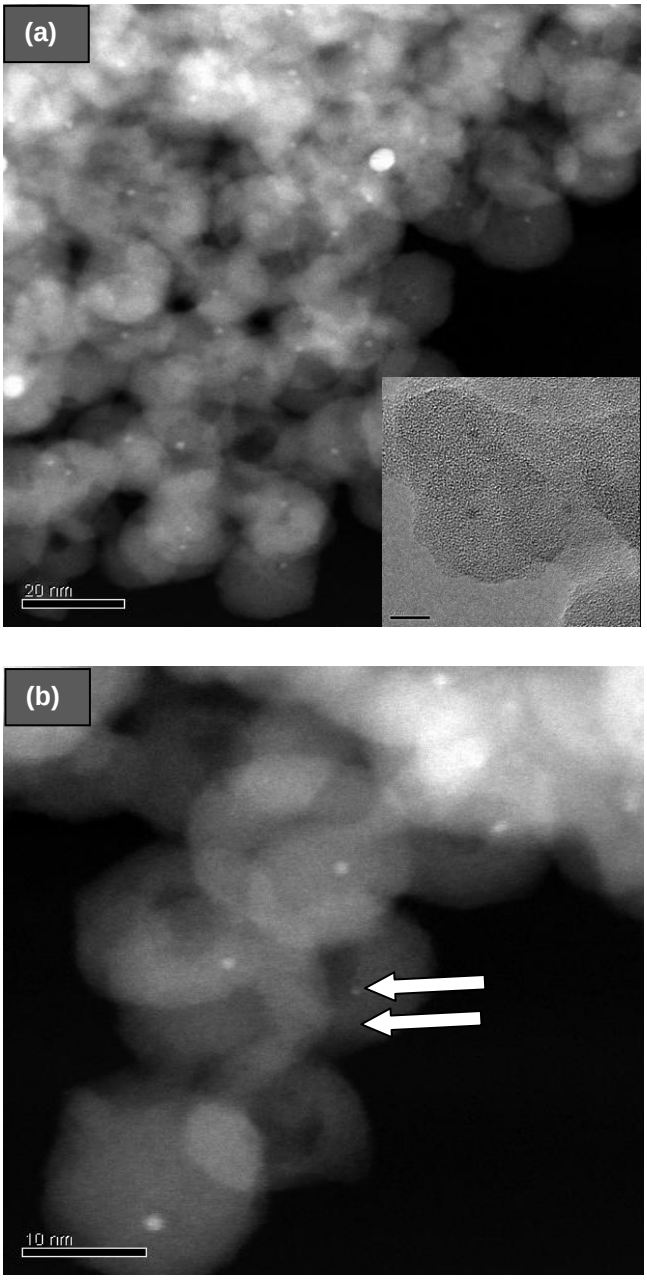

Fig. S18. Representative HAADF-STEM images (a,b) of Au@SiO_2_AP_C after catalytic reaction (inset showing TEM image).

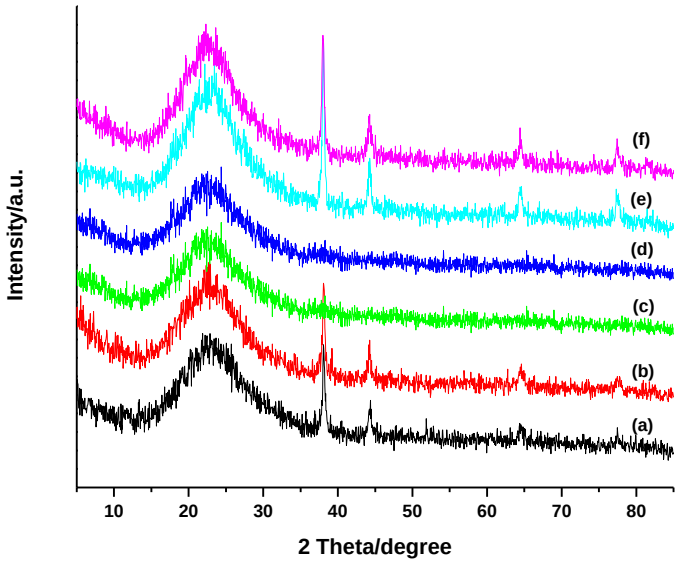

Fig. S19. Powder XRD profiles for $Au@SiO_2$ (a) before and (b) after catalysis, $Au@SiO_2$_EN (c) before and (d) after catalysis, and $Au@SiO_2$_AP (e) before and (f) after catalysis.

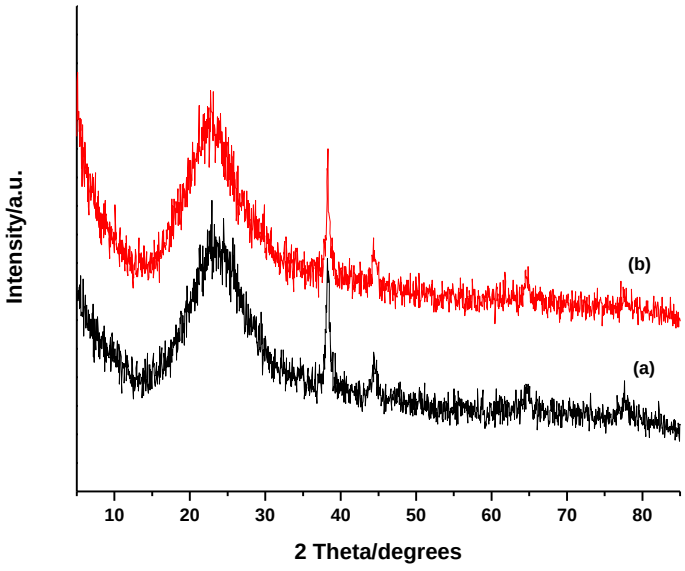

Fig. S20. Powder XRD profiles for $Au@SiO_2$_AP catalyst (prepared by using hydrazine as the reducing agent) (a) before and (b) after catalysis.

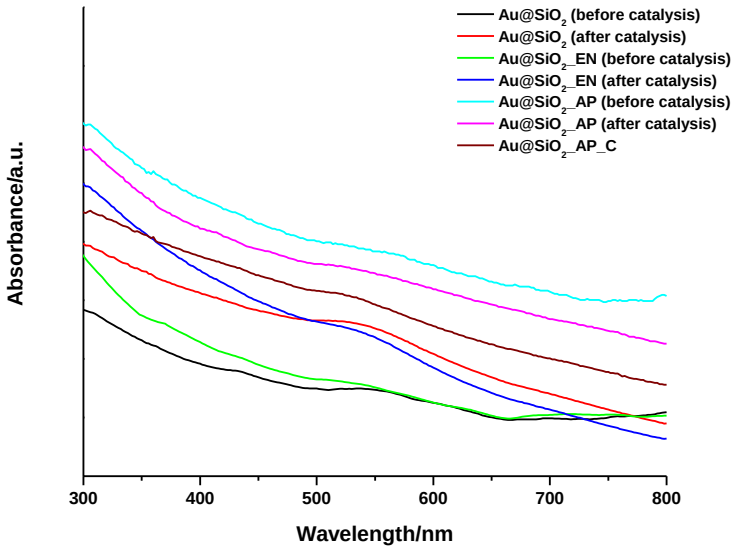

Fig. S21. UV-vis absorption spectra of $Au@SiO_2$, $Au@SiO_2$_EN, $Au@SiO_2$_AP, and $Au@SiO_2$_APW_C.

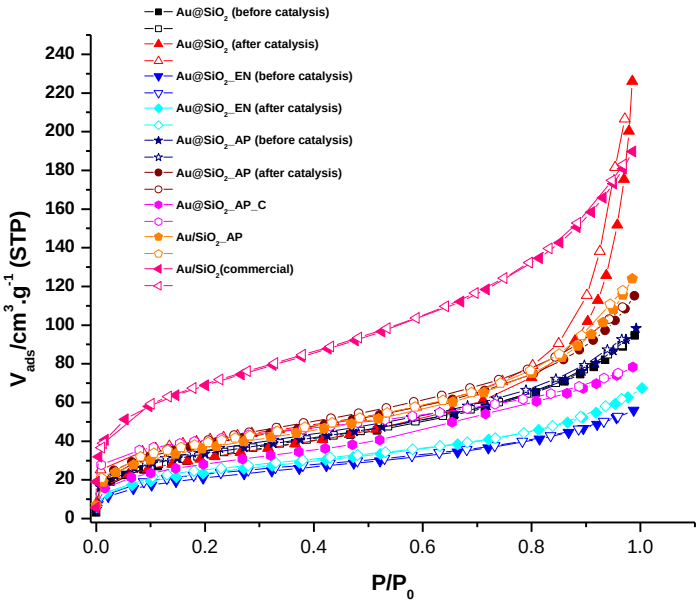

Fig. S22. Nitrogen adsorption isotherms of $Au@SiO_2$, $Au@SiO_2$_EN, $Au@SiO_2$_AP, $Au@SiO_2$_APW_C, Au/SiO_2_AP, and Au/SiO_2 (commercial) at 77 K.