Electronic Supplementary Material (ESI) for RSC Advances


SUPPLEMENTARY INFORMATION

For

# Ni-substituted $LaMnO_3$ Perovskites for Ethanol Oxidation

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Table S1. Reduction properties of $LaMn_{1-y}Ni_yO_3$ catalysts.

| catalyst | | TPR test | | |
|---|---|---|---|---|
| | | $T_{low}$ peak[a] | $T_{high}$ peak[b] | $T_{high}/T_{low}$ |
| y = 0 | T (°C) | 337 | 747 | |
| | mmol/g cat. | 1.23 (40%) | 1.83 (60%) | 1.5 |
| y = 0.1 | T (°C) | 335 | 783 | |
| | mmol/g cat. | 0.92 (31%) | 2.05 (69%) | 2.2 |
| y = 0.25 | T (°C) | 397 | 738 | |
| | mmol/g cat. | 1.35 (37%) | 2.33 (63%) | 1.7 |
| y = 0.4 | T (°C) | 359 | 736 | |
| | mmol/g cat. | 1.29 (33%) | 2.63 (67%) | 2.0 |
| y = 1 | T (°C) | 347 | 469 | |
| | mmol/g cat. | 3.08 (51%) | 3.01 (49%) | 1.0 |

[a] Maximum temperature of reduction peak below 500 °C except $LaNiO_3$ (y = 1), which used 400 °C as the demarcation.

[b] Maximum temperature of reduction peak above 500 °C except $LaNiO_3$ (y = 1), which used 400 °C as the demarcation.

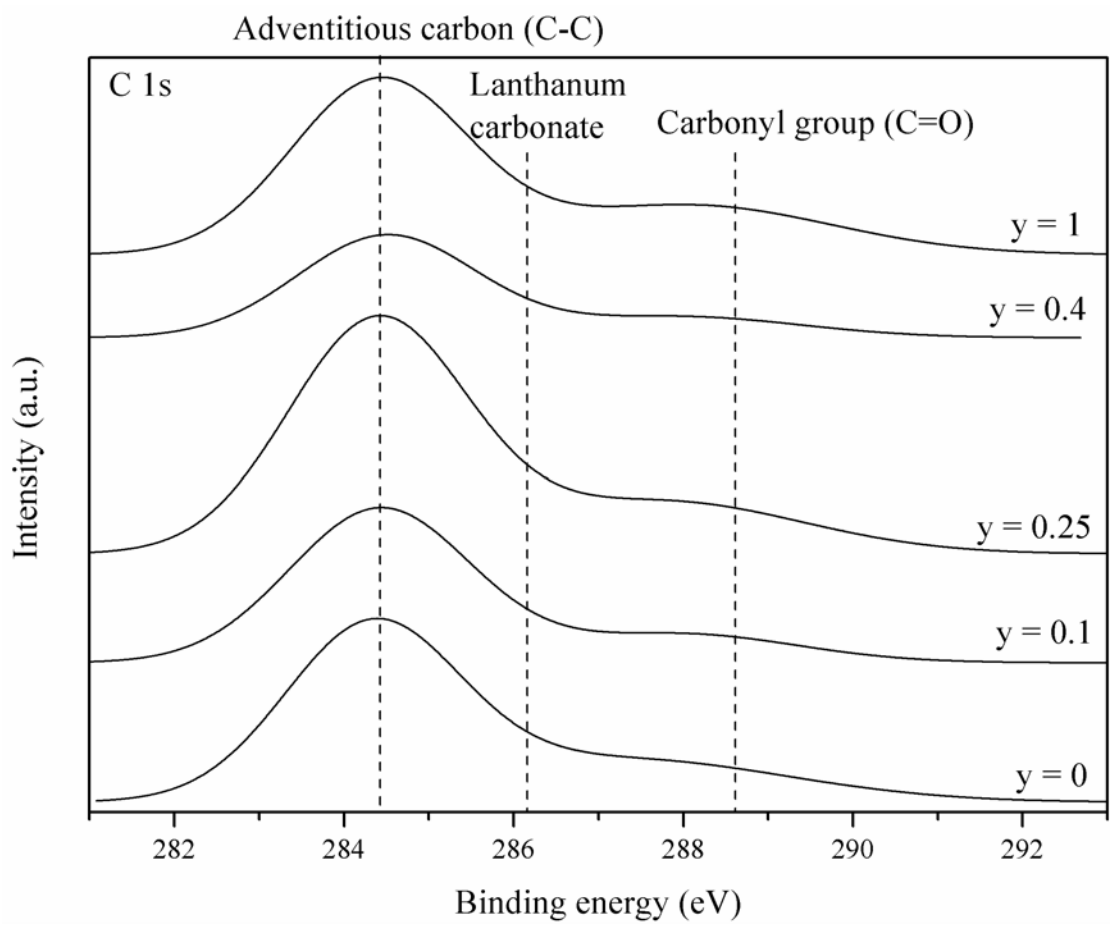



Fig. S1. C 1s core level spectra of $LaMn_{1-y}Ni_yO_3$ perovskites.

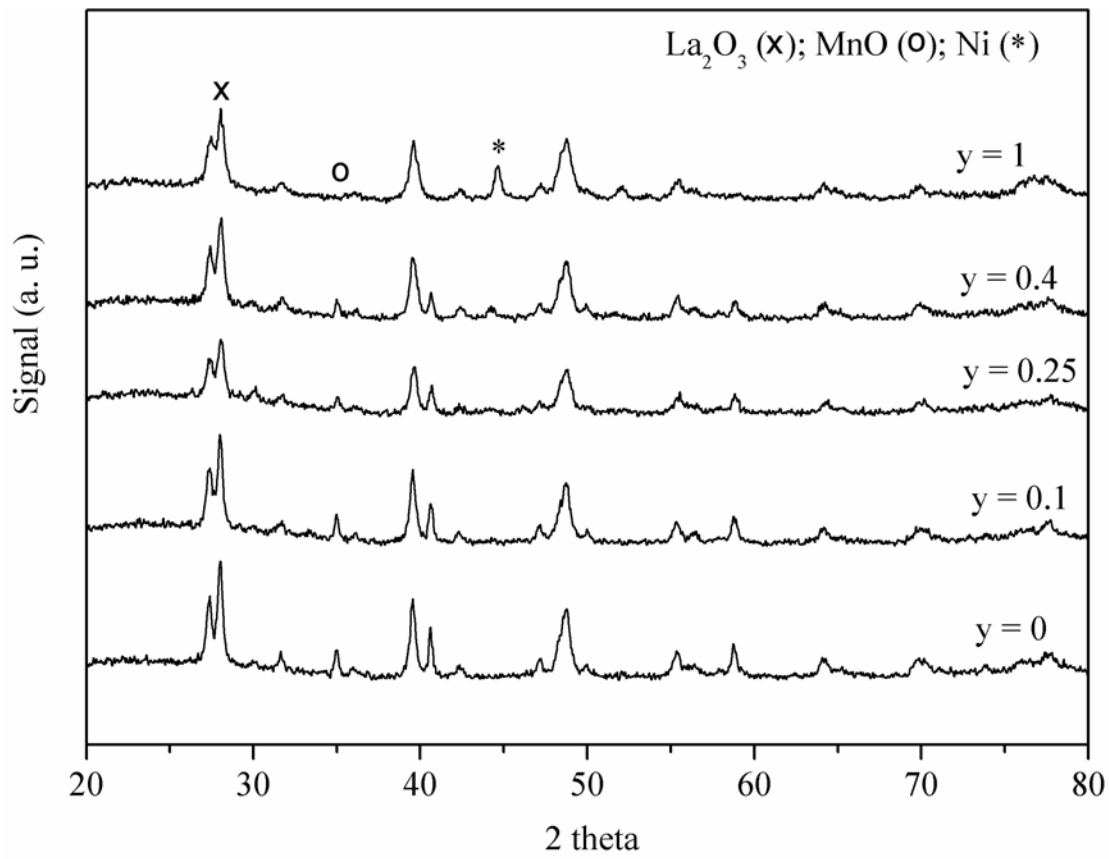



Fig. S2. XRD patterns of post-TPR samples.

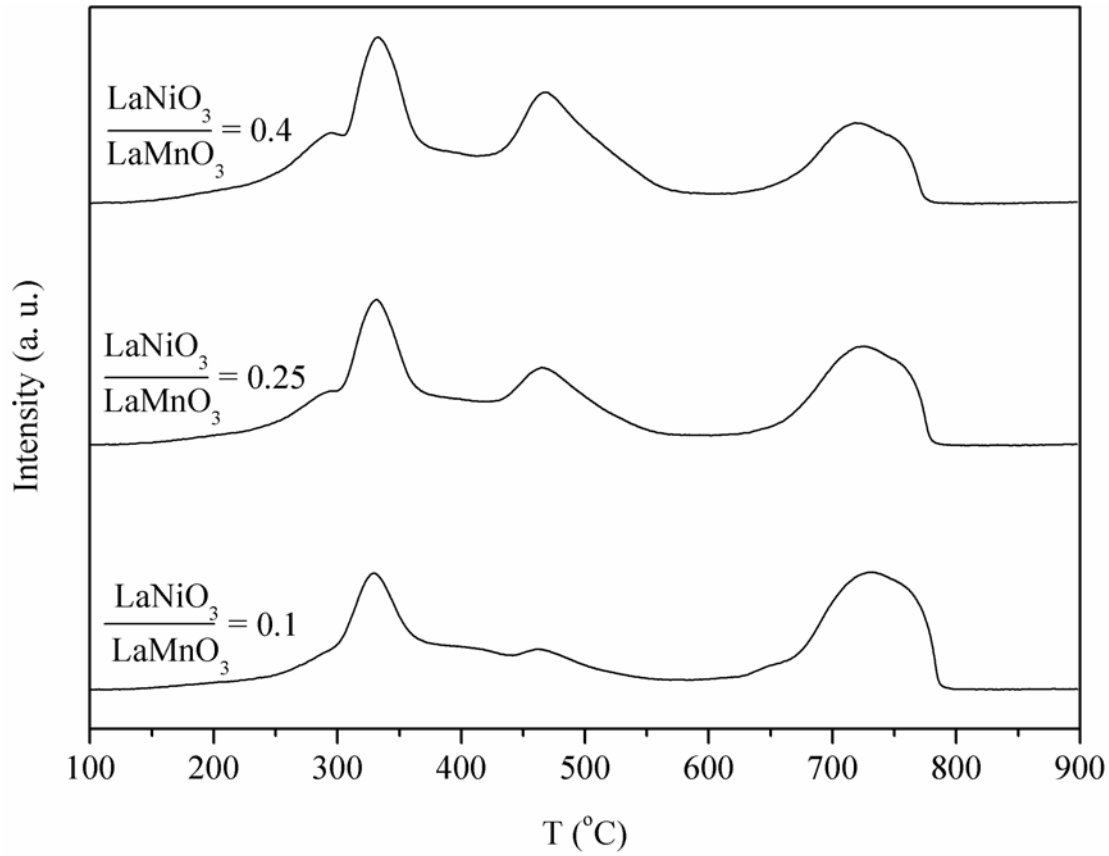



Fig. S3. TPR profiles of physically mixed $LaMnO_3$ and $LaNiO_3$ particles.

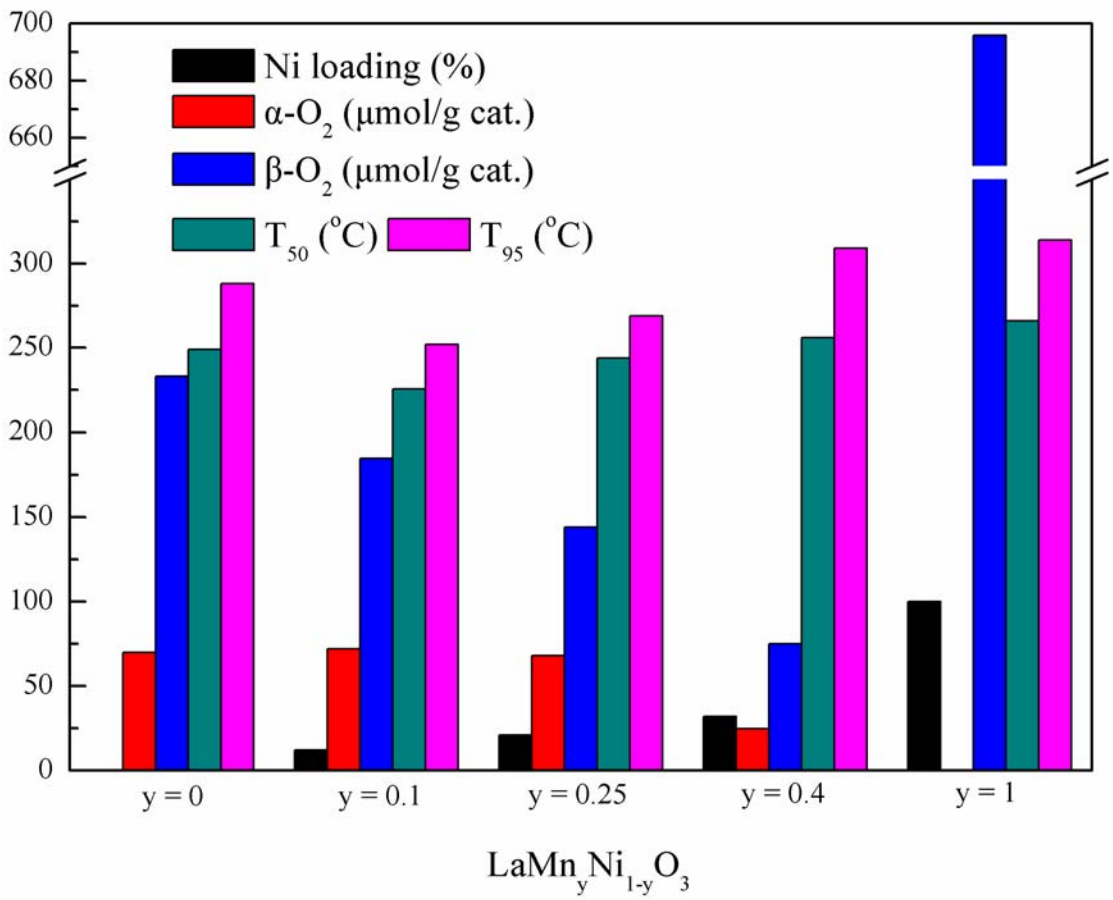



Fig. S4. The variations of XPS-derived Ni loading (%), amounts of α- and β-oxygen (μmol/g cat.), and $T_{50}$ and $T_{95}$ ($^{o}$C) of testes $LaMn_{1-y}Ni_yO_3$ as functions of y values.

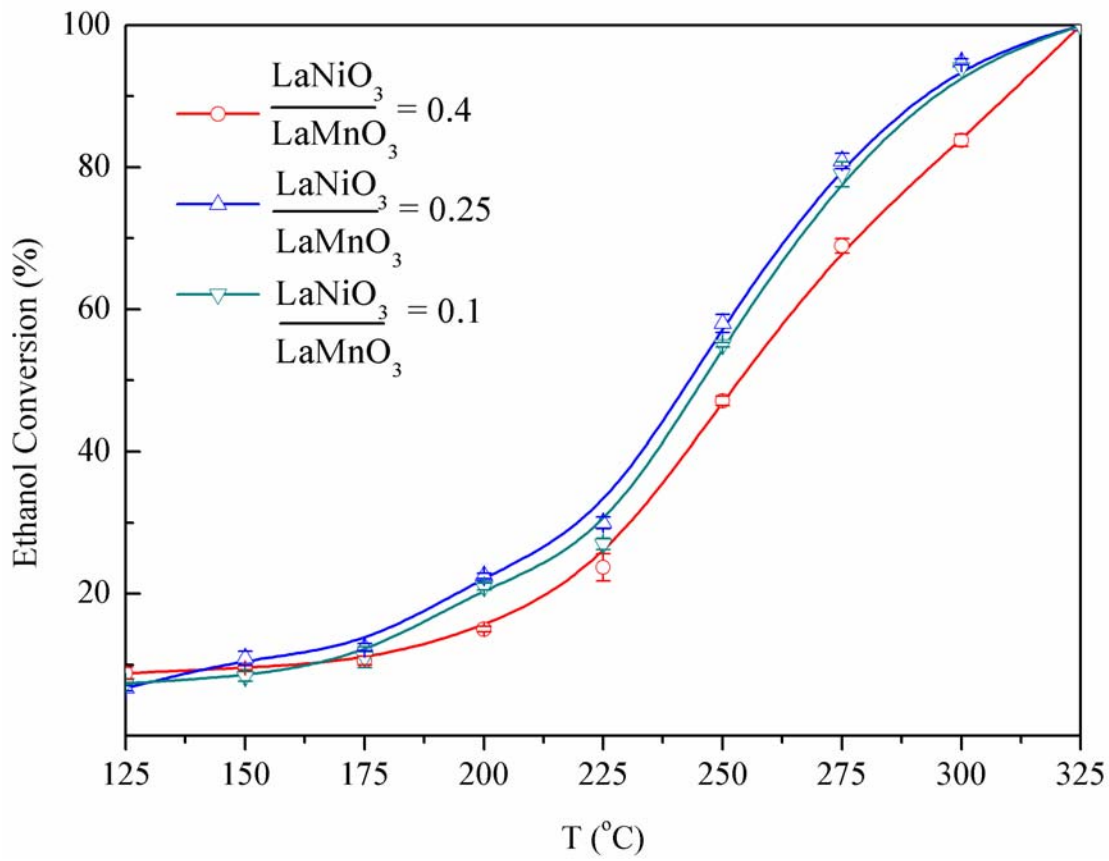



Fig. S5. Conversion of ethanol as a function of temperature over physically mixed $LaMnO_3$ and $LaNiO_3$ particles.

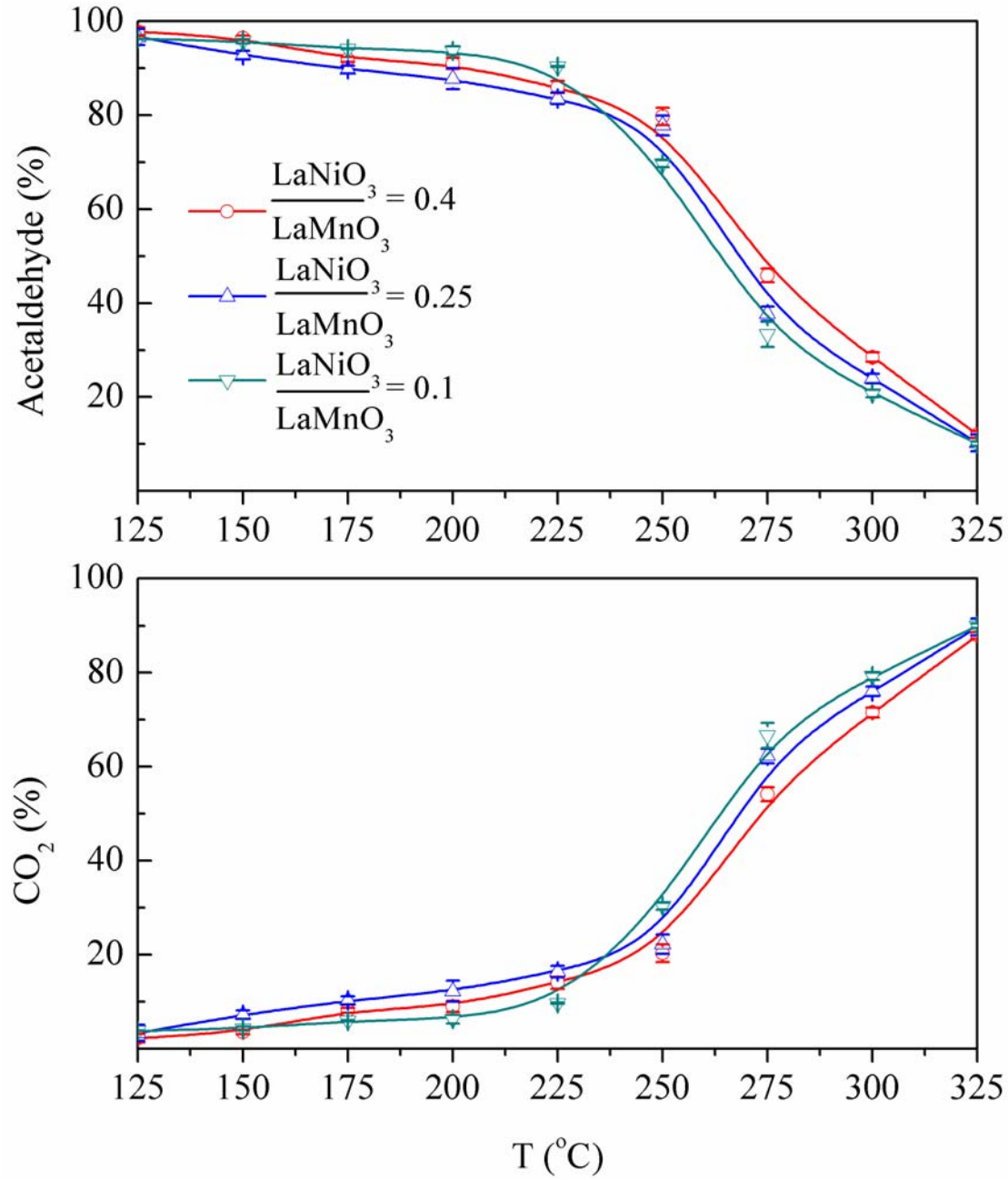



Fig. S6. Acetaldehyde and carbon dioxide selectivities as functions of temperature over physically mixed $LaMnO_3$ and $LaNiO_3$ particles.

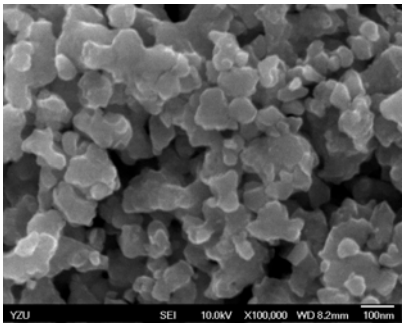
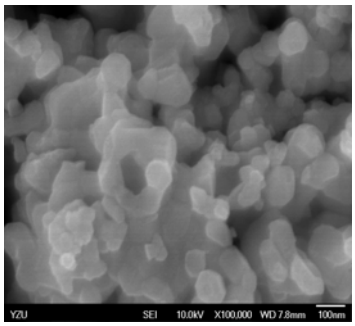
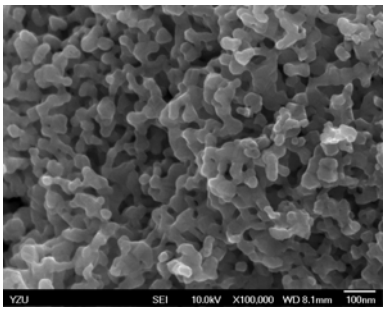
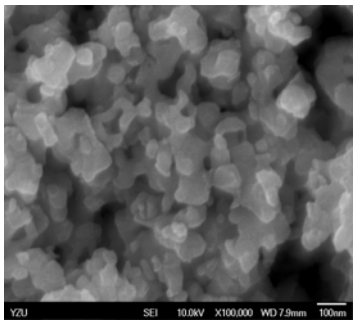
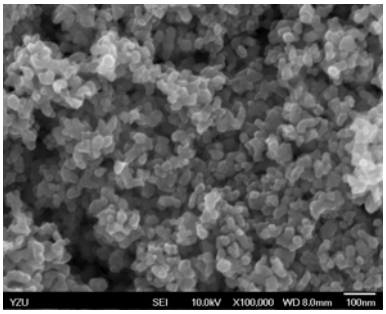
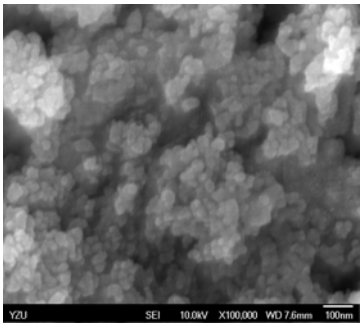
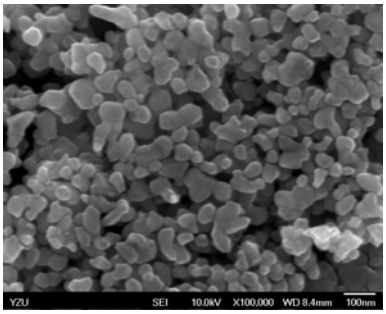
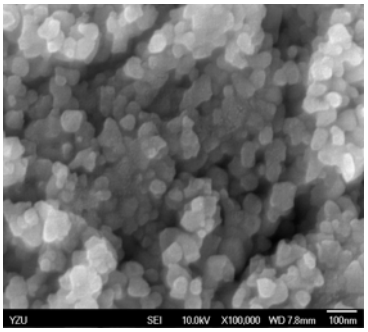
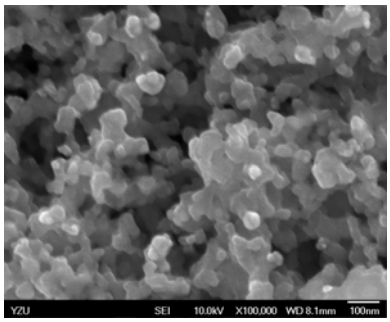
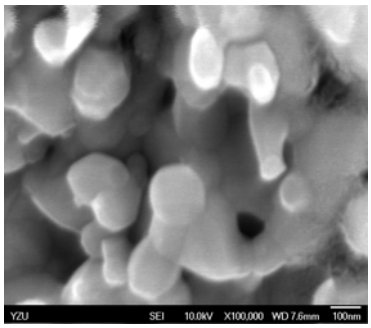
| | as-synthesized | post on-stream tested |
|---|---|---|
| y=0 |  |  |
| y=0.1 |  |  |
| y=0.25 |  |  |
| y=0.4 |  |  |
| y=1 |  |  |

Fig. S7. SEM images of as-synthesized and used $LaMn_{1-y}Ni_yO_3$.