Electronic Supplementary Information (ESI) for

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Highly active three-way catalysis of rhodium particles on a Y-stabilized La-containing ZrO_2 support: Effect of Y on the enhanced reducibility of rhodium and self-regeneration

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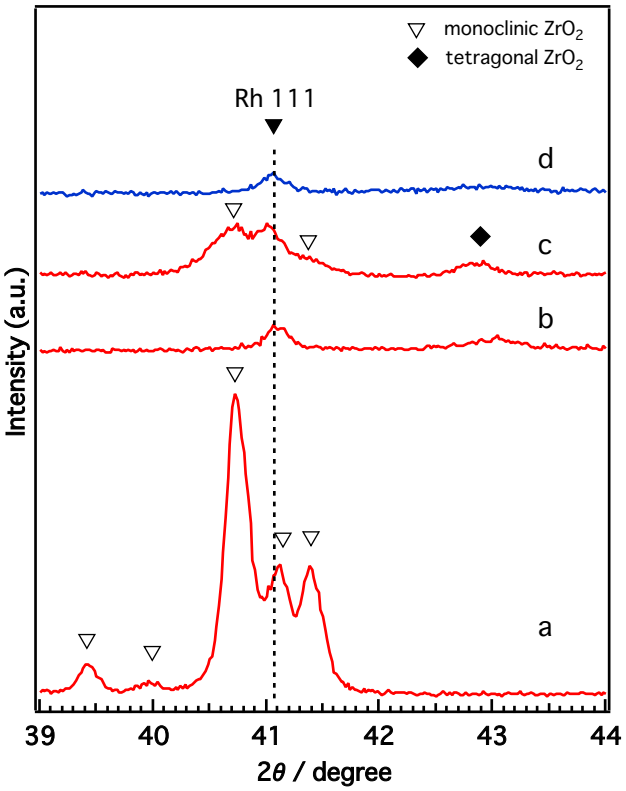


Fig. S1. XRD patterns for the aged catalysts of Rh111 region at (a) Rh/ZrO_2, (b) Rh/Zr–Y–O, (c) Rh/Zr–La–O and (d) Rh/Zr–Y–La–O. Aging was conducted at 1273 K in a 2 % O_2, 10 % H_2O, N_2 atmosphere for 24 h.

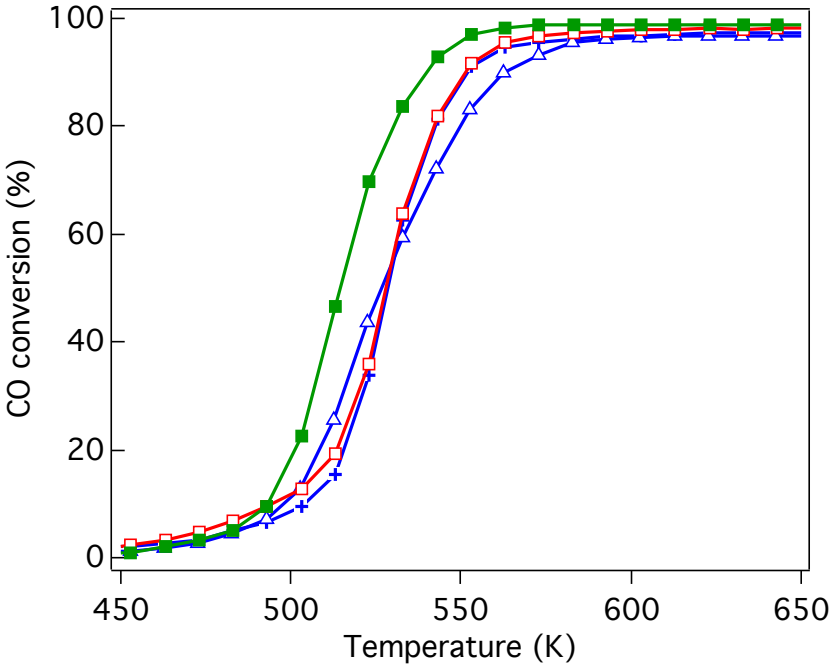


Fig. S2. CO conversion of the fresh three-way catalysts that underwent the reaction gas pre-treatment. The catalysts studied were (+) Rh/ZrO_2, (△) Rh/Zr–Y–O, (□) Rh/Zr–La–O, and (■) Rh/Zr–Y–La–O.

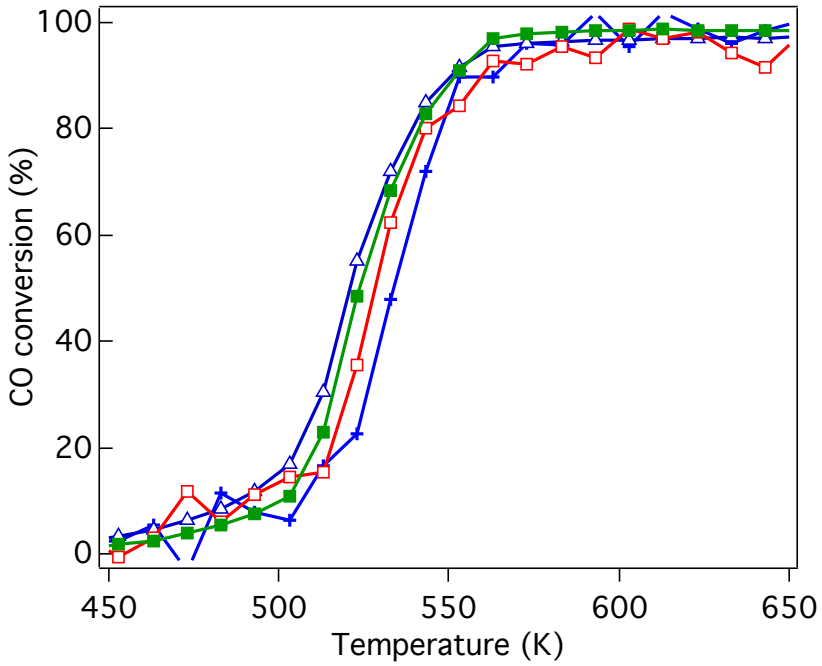


Fig. S3. CO conversion by the fresh three-way catalysts that underwent the oxidation treatment. The catalysts studied were (+) Rh/ZrO_2, (△) Rh/Zr–Y–O, (□) Rh/Zr–La–O, and (■) Rh/Zr–Y–La–O.

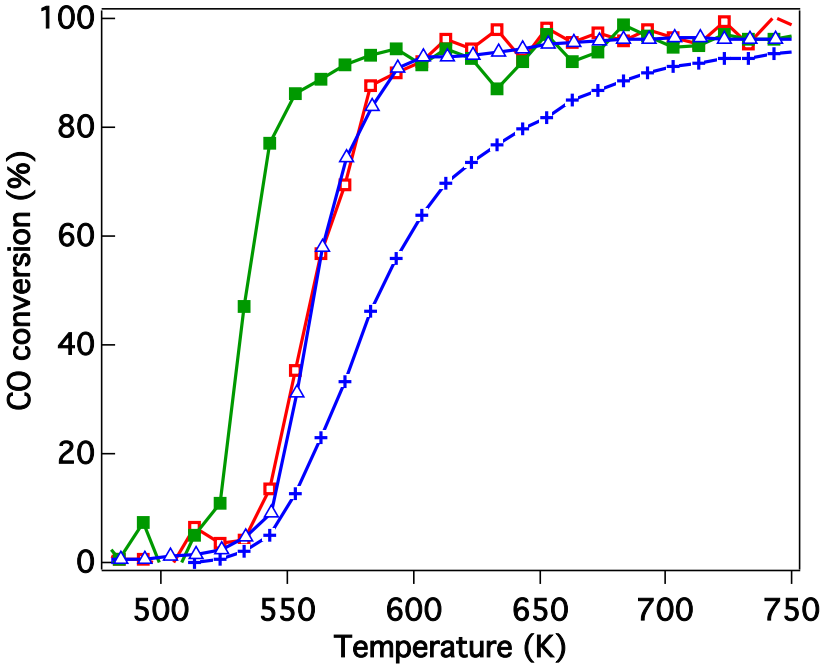


Fig. S4. CO conversion by the aged three-way catalysts that underwent the reaction gas pre-treatment. The catalysts studied were (+) Rh/ZrO_2, (△) Rh/Zr–Y–O, (□) Rh/Zr–La–O, and (■) Rh/Zr–Y–La–O.

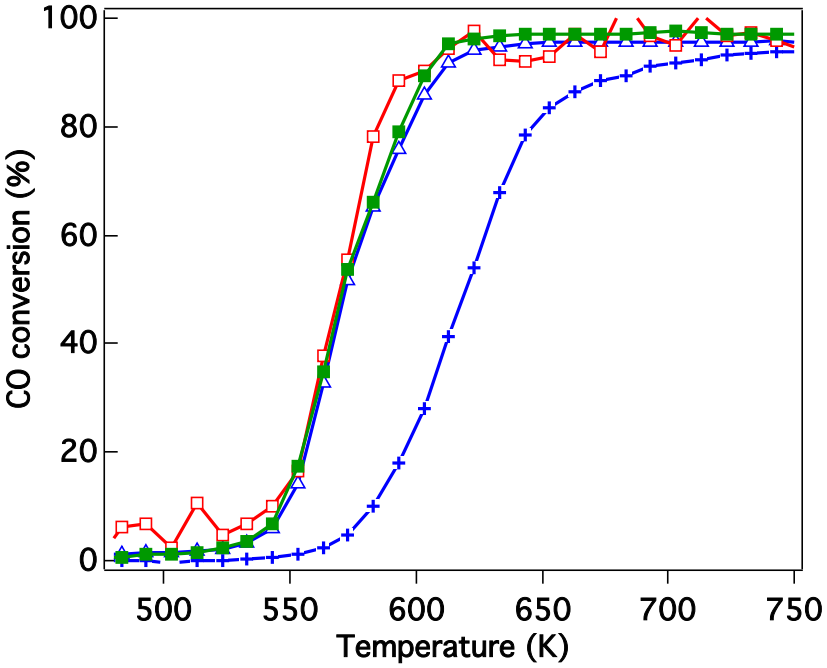


Fig. S5. CO conversion by the aged three-way catalysts that underwent the oxidation treatment. The catalysts studied were (+) Rh/ZrO_2, (△) Rh/Zr–Y–O, (□) Rh/Zr–La–O, and (■) Rh/Zr–Y–La–O.

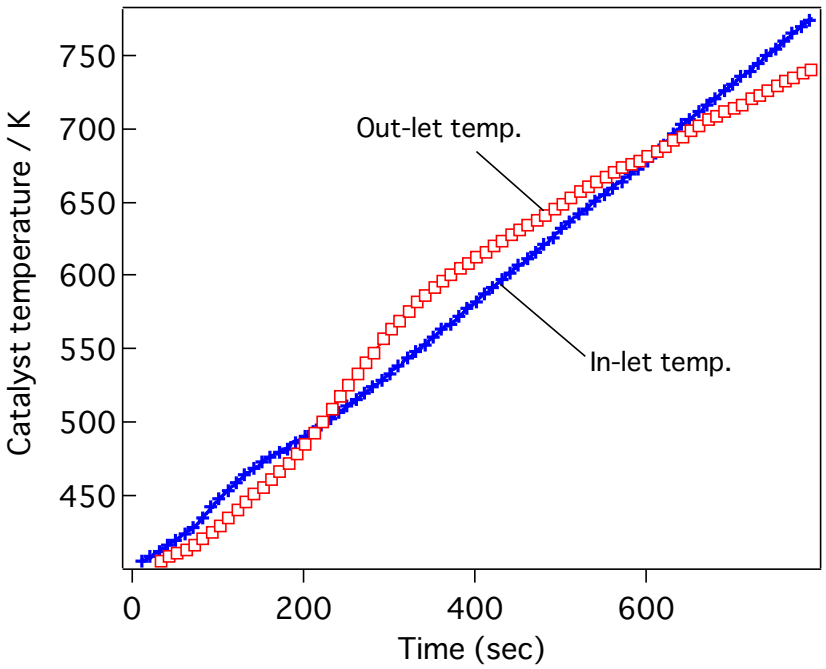


Fig. S6. Catalyst in-let and out-let temperature during the three-way catalytic activity measurement of aged Rh/Zr–Y–La–O. Aging was conducted at 1273 K and in 2 % O_2 and 10 % H_2O/N_2 for 24 h.

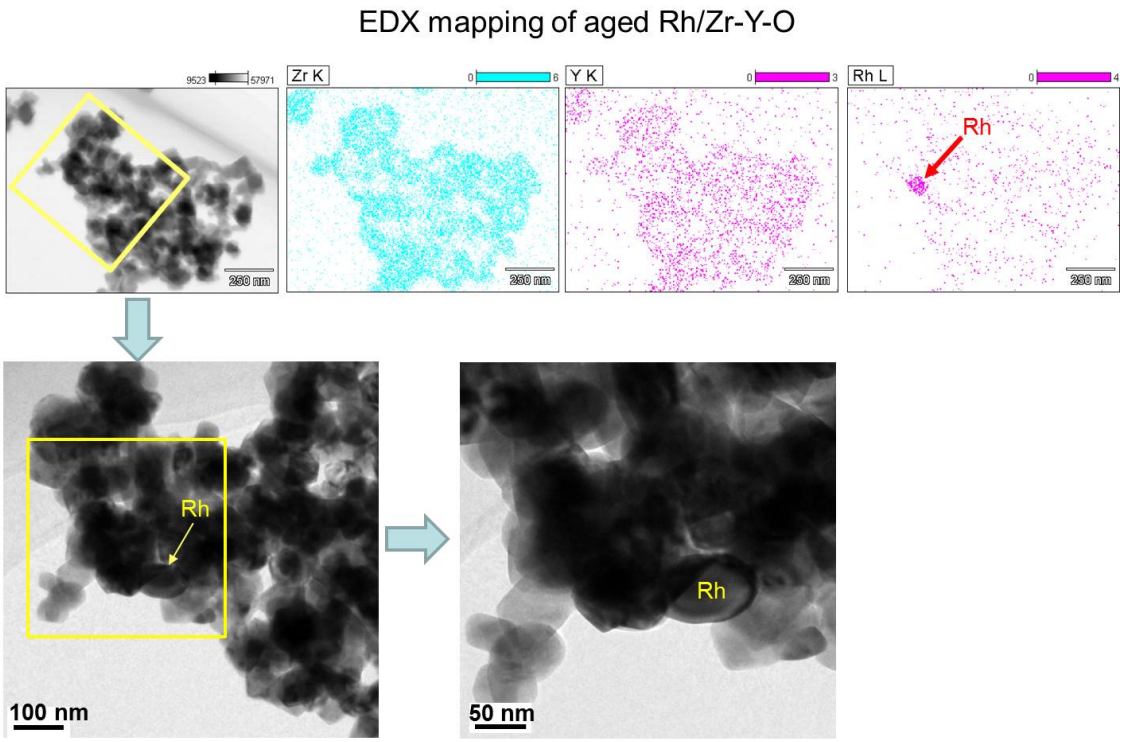
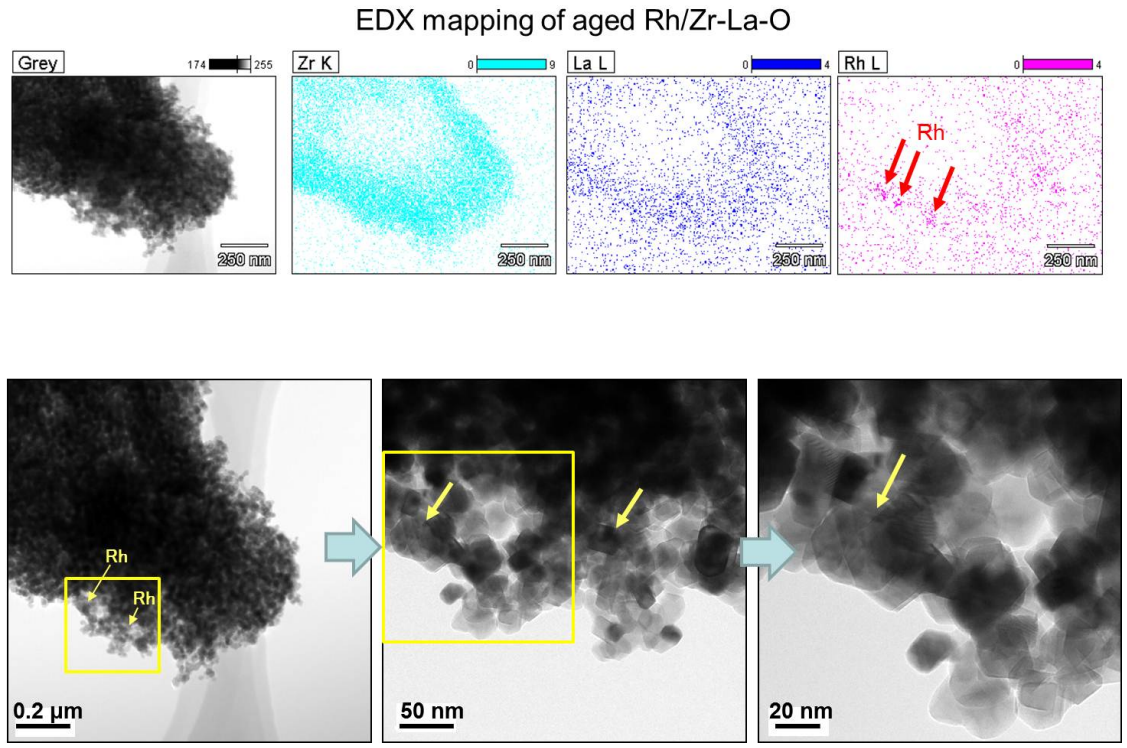


Fig. S7. EDX mapping of aged Rh/Zr–Y–O. Aging was conducted at 1273 K and in 2 % O_2 and 10 % H_2O/N_2 for 24 h.



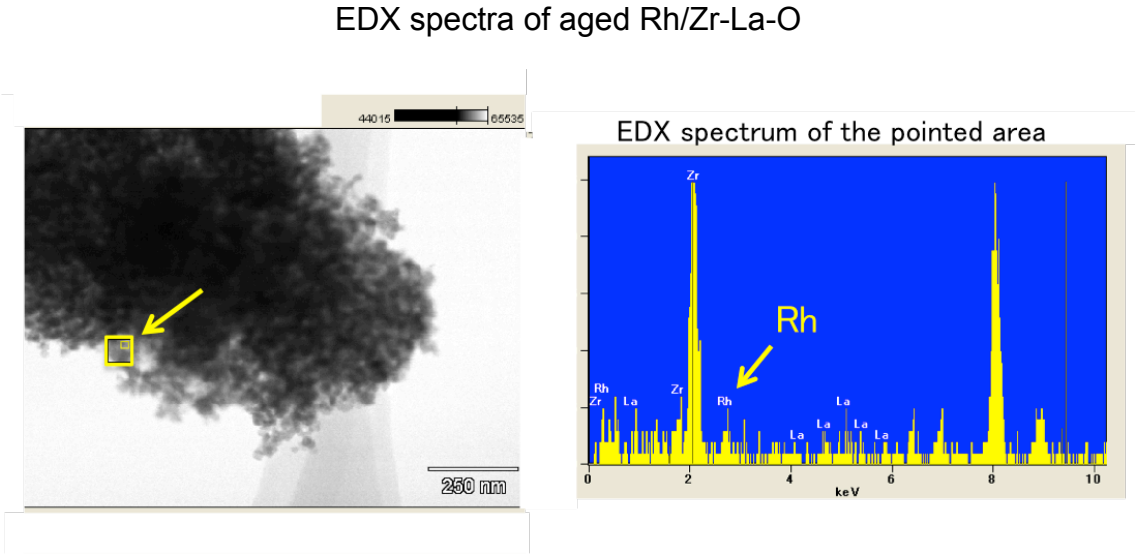


Fig. S8. EDX mapping and EDX spectrum of aged Rh/Zr–La–O. Aging was conducted at 1273 K and in 2 % O_2 and 10 % H_2O/N_2 for 24 h.

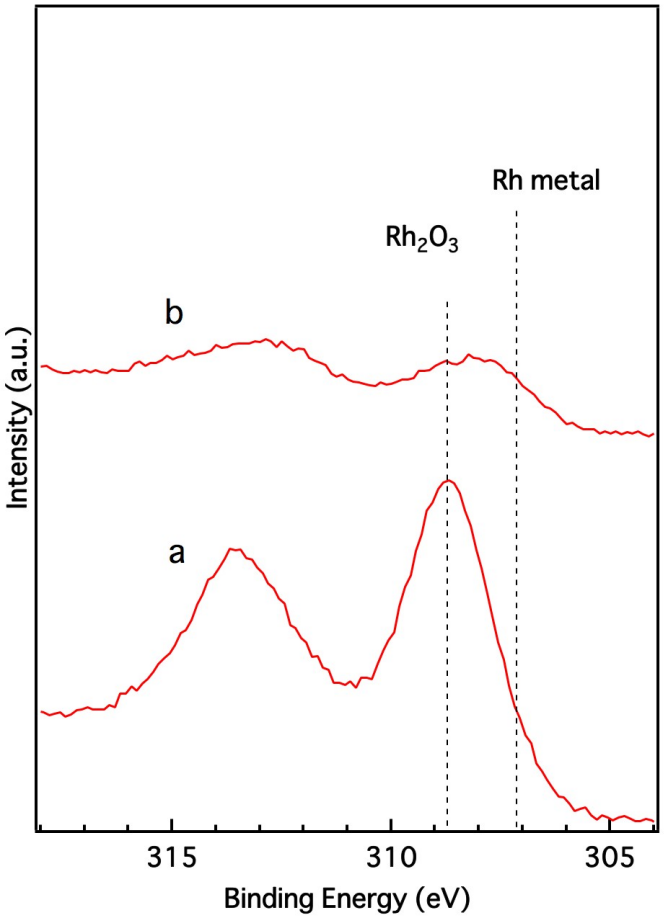


Fig. S9. (Re-numbered: At first submit, as Fig. S1) Rh 3d spectra of the fresh catalysts after the three-way catalytic reaction at 773 K for 10 min and 5 % O_2 exposure at 773 K for 5 min. (a) Rh/ZrO_2, (b) Rh/Zr–La–O.

End of the ESI