Electronic Supplementary Material (ESI) for RSC Advances.

Hollow Sr/Rh-codoped TiO_2 Photocatalyst for Efficient Sunlight-driven Organic Compound Degradation

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SUPPORTING INFORMATION

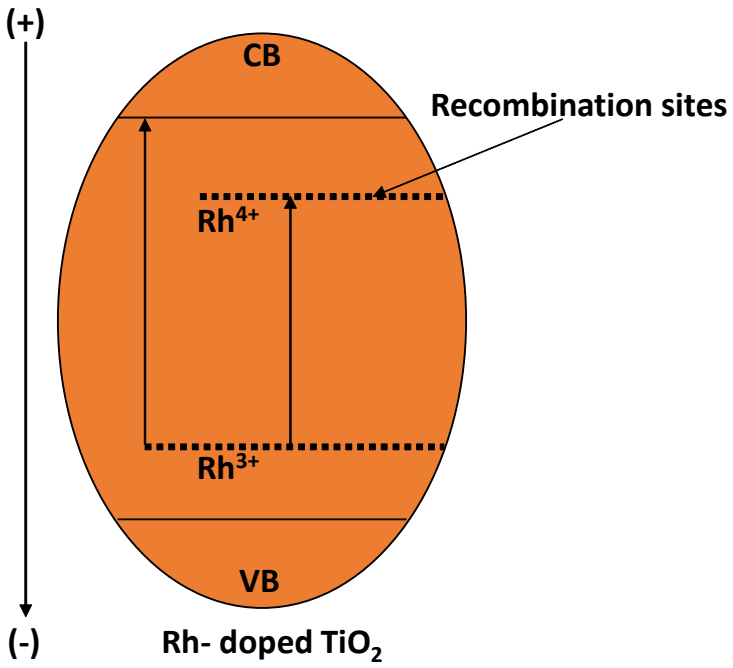

Figure SI 1. Illustration of the two states of Rh^{3+} and Rh^{4+}- doped TiO_2. Rh^{3+} contributes a donor level to the valence band, narrowing the band gap and shifting light absorption to the visible region, whereas Rh^{4+} introduces an electron acceptor level below the conduction band, which serves as a recombination site, reducing the activity of the materials. [1, 2]

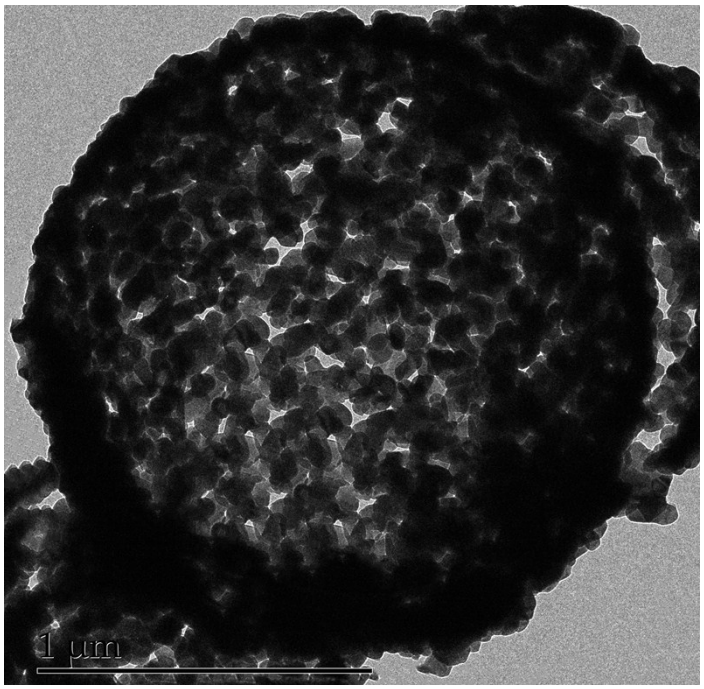

Figure SI 2. TEM image of hollow Rh/Sr-TiO_2-900.

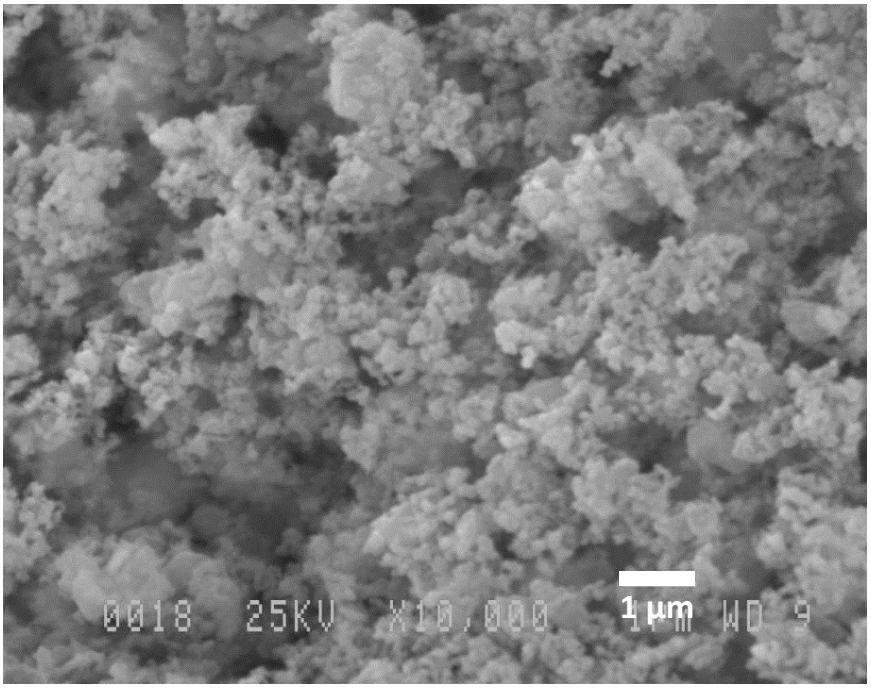

Figure SI 3. SEM image of Rh-TiO_2-900.

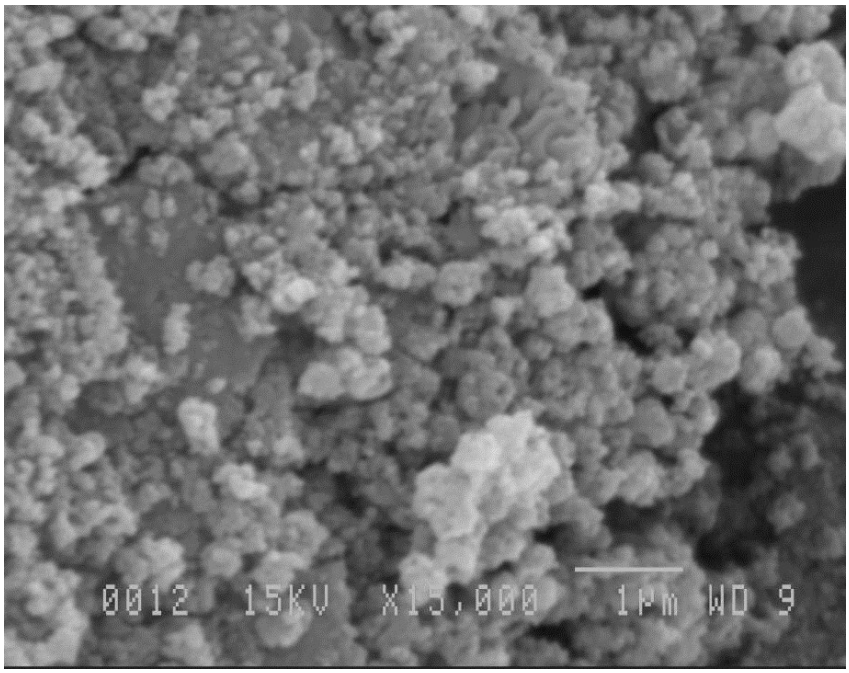

Figure SI 4. SEM image of TiO_2-900.

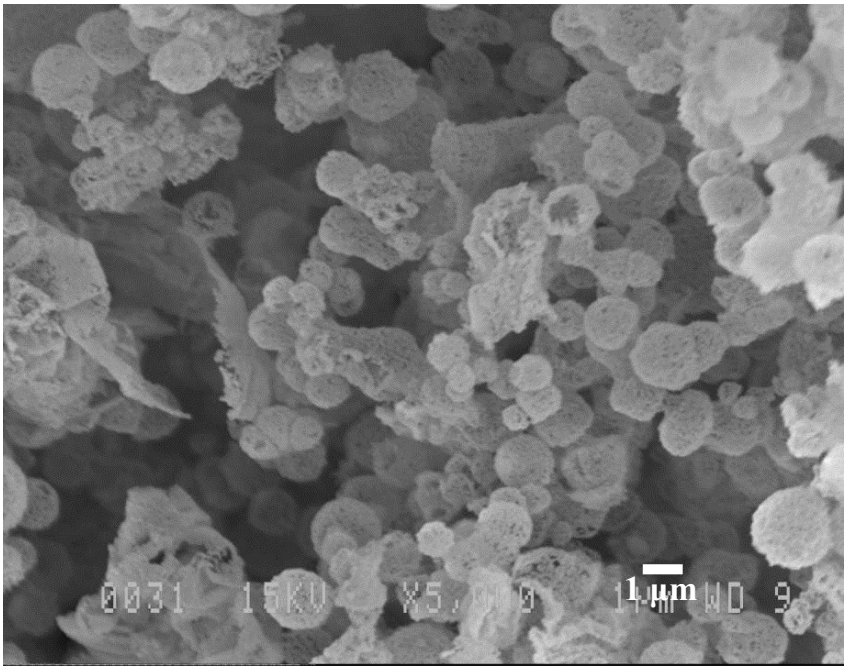

Figure SI 5. SEM image of hollow Sr-TiO_2-900.

Figure SI 6. Photograph of hollow Sr/Rh-TiO_2-550 and hollow Sr/Rh-TiO_2-900 indicates the critical change in colour from white to yellow after calcination at 900 ^{0}C

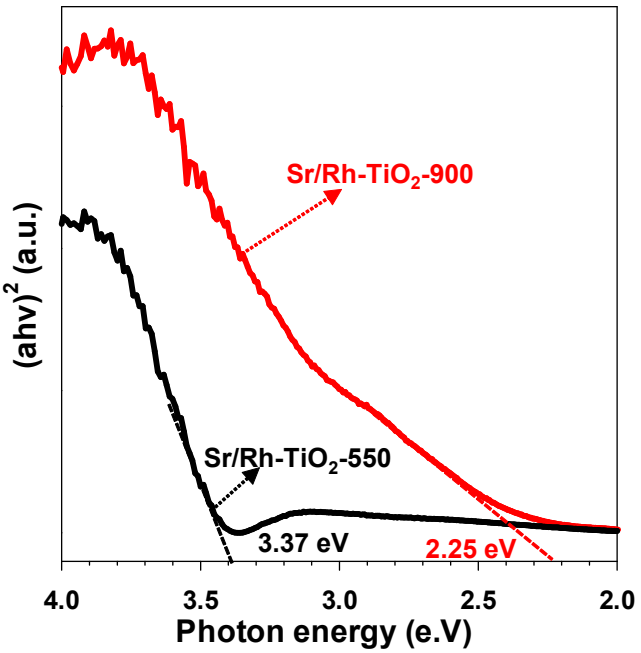

Figure SI 7. Plot of $(\alpha h\nu)^2$ versus photon energy for the band gap energies of hollow Rh,Sr-TiO_2 after calcination at (a) 550 °C and (b) 900 °C.

Table SI 1. Binding energy of Ti2p and O1s peaks.

Sample	**TiO_2 Phase**	**Ti $2p_{3/2}$ position (eV)**	**O 1S position (eV)**
A-TiO_2	Anatase	458.4	529.8
Hollow Sr/Rh-TiO_2-550	Anatase	458.4	529.8
R-TiO_2	Rutile	458.3	529.**6**
Hollow Sr-TiO_2-900	Rutile	458.3	529.**6**
Rh-TiO_2-900	Rutile	458.2	529.**3**
Hollow Sr/Rh-TiO_2-900	Rutile	457.8	529.**9**

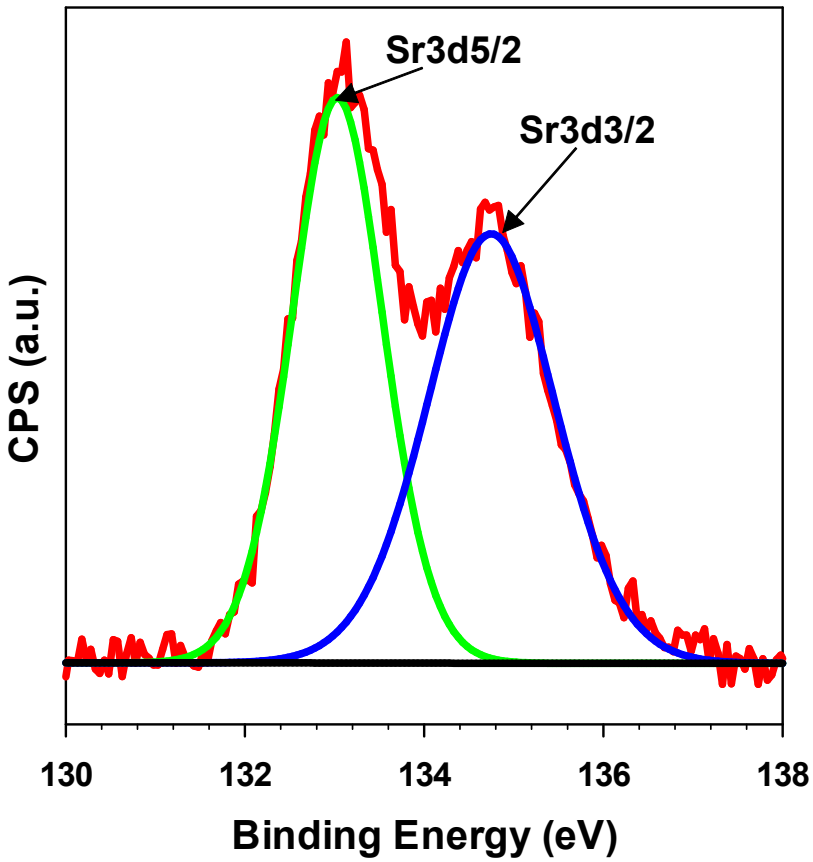

Figure SI 8. Sr_{3d} deconvolution peak of hollow Sr/Rh-TiO_2-900.

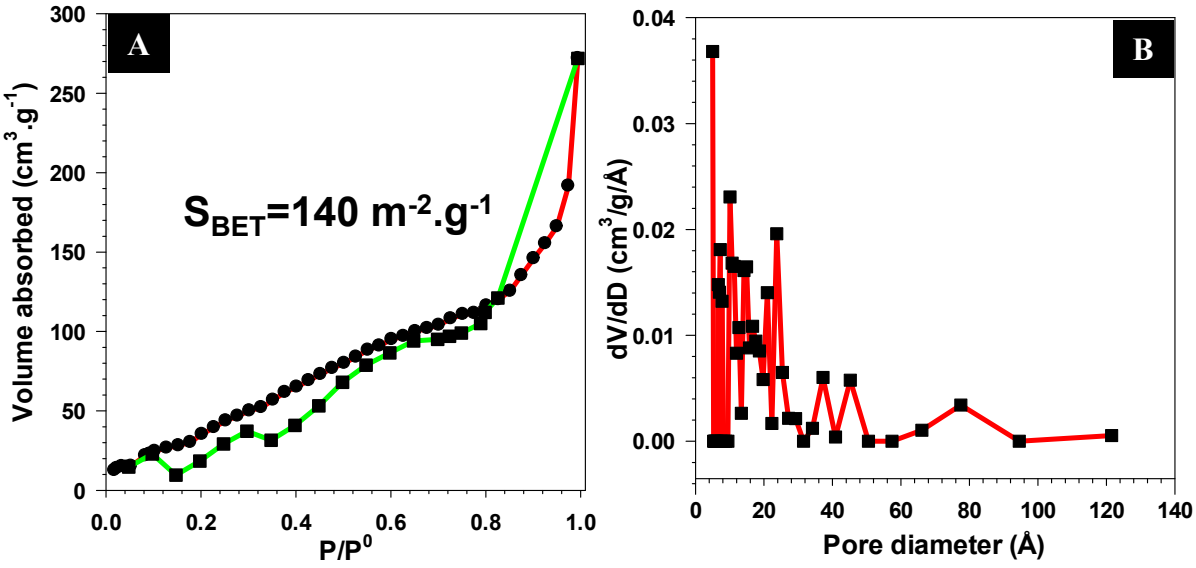

Figure SI 9. (A) Nitrogen adsorption/desorption isotherms of hollow Sr/Rh-TiO_2-900 . (B) The corresponding BJH pore size distributions.

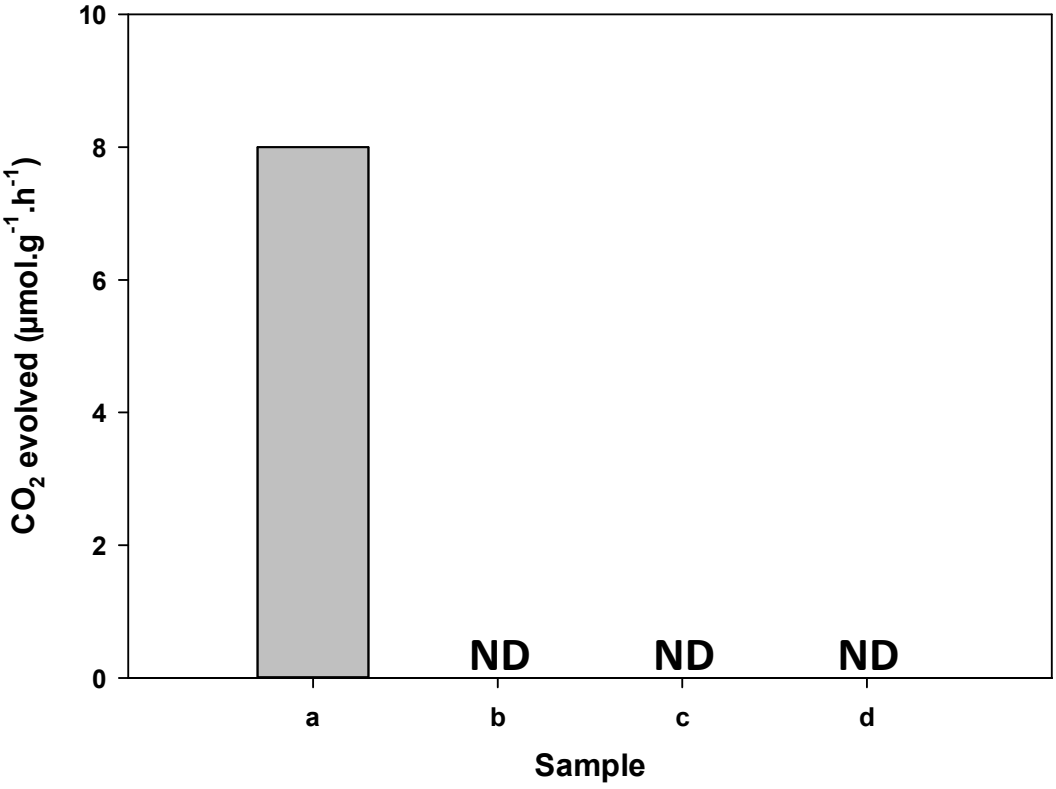

Figure SI 10. CO_2 formation from the photodegradation of isopropanol of different types of free- Pt photocatalysts under solar simulator irradiation (AM 1.5 G, intensity 100 mW cm−2): a) hollow Sr/Rh-TiO_2-900; b) bulk Sr/Rh-TiO_2-B; c) rutile TiO2; d) Rh-TiO_2-900. ND: not detected**.**

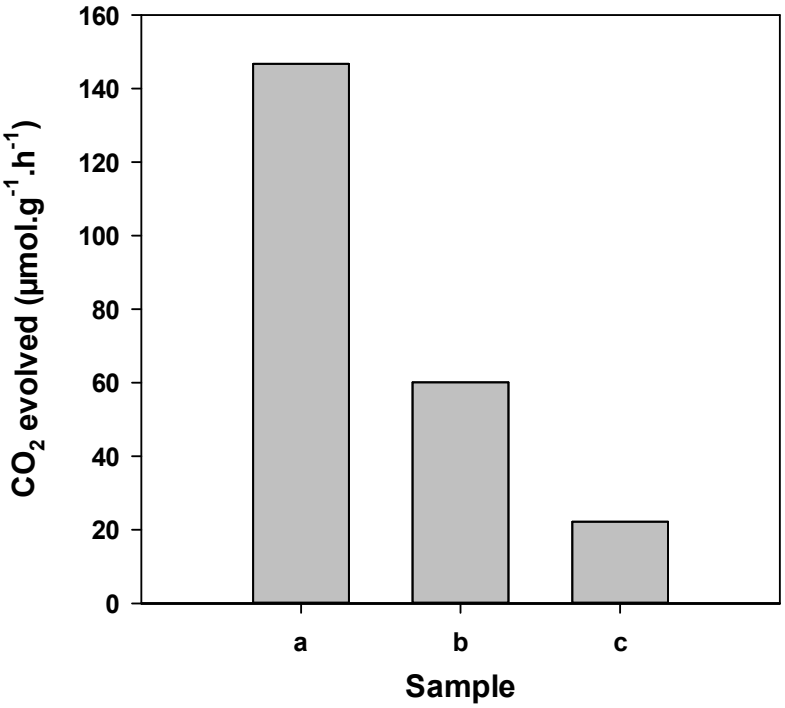

Figure SI 11. CO_2 formation from the photo-degradation of isopropanol of 1.0% Pt-supported samples under solar simulator irradiation (AM 1.5 G, intensity 100 mW cm^{-2}): a) hollow Sr/Rh-TiO_2-900; b) hollow Sr/Rh-TiO_2-550; c) TiO_2- P25.

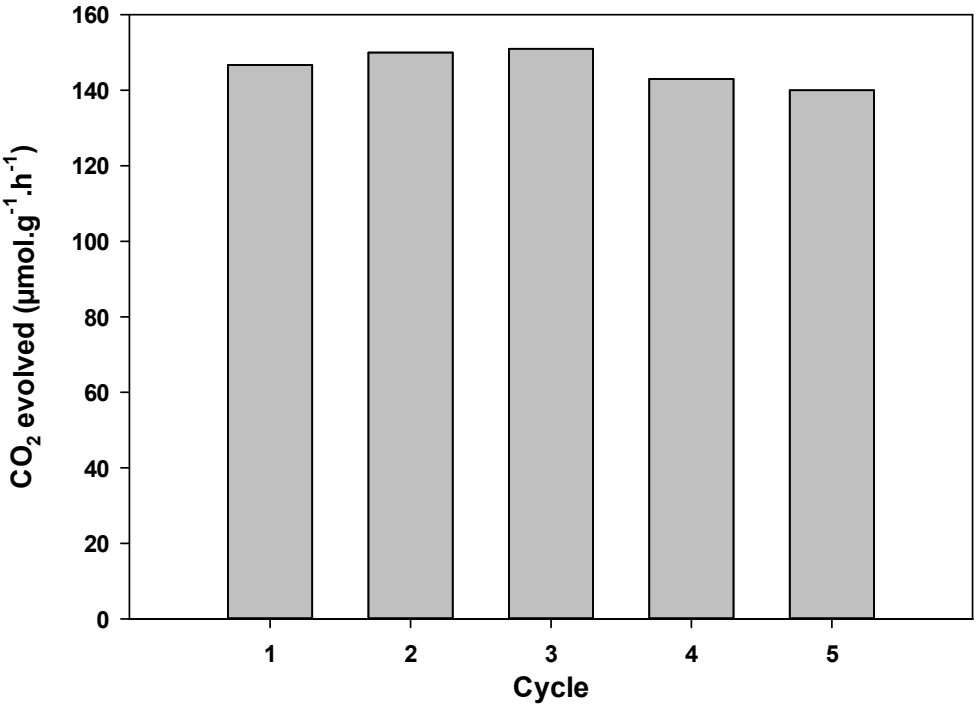

Figure SI 12. The stability of the hollow Sr/Rh-TiO2-900 over 5 cycles

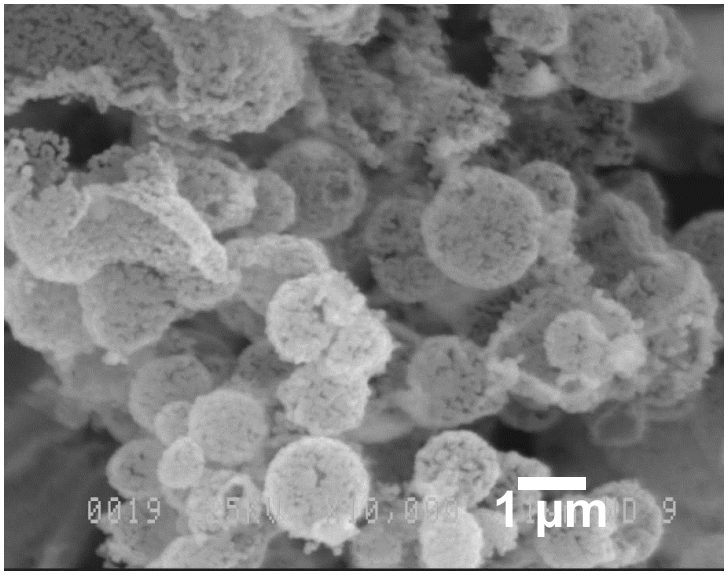

Figure SI 13. SEM image (A) and XRD pattern (B) of the hollow Sr/Rh-TiO_2-900 after five cycles of reaction

1. Q. Sun and Y. Xu, *The Journal of Physical Chemistry C*, 2010, **114**, 18911-18918.
2. E. Glover, S. Ellington, G. Sankar and R. Palgrave, *Journal of Materials Chemistry A*, 2016,**4**, 6946-6954 .