Supplementary Material (ESI) for Chemical Communications
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Supporting Information

Ceria-Terbia Solid Solution Nanobelts with High Catalytic Activities for CO Oxidation

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Catalytic Activity Measurements

The catalytic activity of CO oxidation was evaluated in a conventional fixed-bed quartz microreactor (8 mm in outer diameter) using 250 mg of catalyst (20-40 mesh). The system was first purged with high-purity N_2 gas (40 mL min^{-1}) and then a gas mixture $CO/O_2/N_2$ (1:20:79) was introduced into the reactor that contained 40 mg samples at a flow rate of 40 mL min^{-1}. The catalyst was directly exposed to reaction gas as the reactor temperature was stabilized at the reaction temperature without any pretreatment. The reaction temperature was monitored by a thermocouple placed in the middle of the catalyst bed. Gas samples were analyzed by an online gas chromatography using a Porapak Q column for the separation of CO_2 and CO and a 5A Molecular Sieve column for the separation of N_2 and O_2. The catalytic performance was evaluated at various temperatures. The OSC was measured by the oxygen release characteristics of $Ce_xTb_{1-x}O_{2-\delta}$ samples in the temperature region 550-1100 K. A commercial Netzsch TG-DTA analyzer (Luxx, STA, 409 PC, Germany) was used to monitor the change in the weight of the sample under cyclic heat treatments in flowing nitrogen or dry air. The heat cycle consisted of heating the sample to 1100 K, cooling to 425 K, and again heating to 1100 K. All heating and cooling rates were 8 K min^{-1}. The weight loss of $Ce_xTb_{1-x}O_{2-\delta}$ sample during the second stage of heat treatment was used to measure the oxygen release properties.

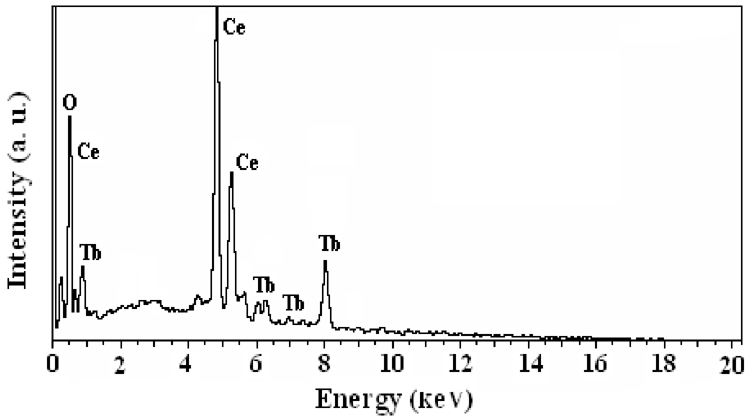

Fig. S1. The typical EDS pattern of $Ce_xTb_{1-x}O_{2-\delta}$ nanobelts prepared in solution of 0.01M $Ce(NO_3)_3$+0.001M $Tb(NO_3)_3$ +0.1M NH_4NO_3 with current density of 2.0 mA/cm^2.

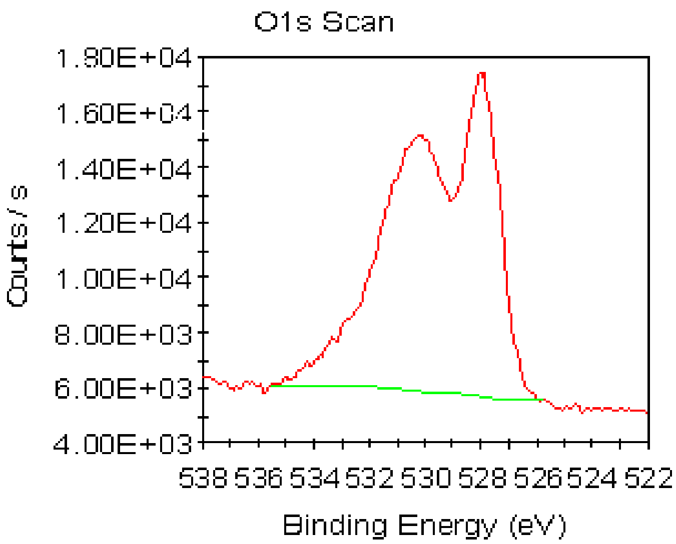

Fig. S2. O1s core level spectrum of $Ce_xTb_{1-x}O_{2-\delta}$ nanobelts (x=0.065).

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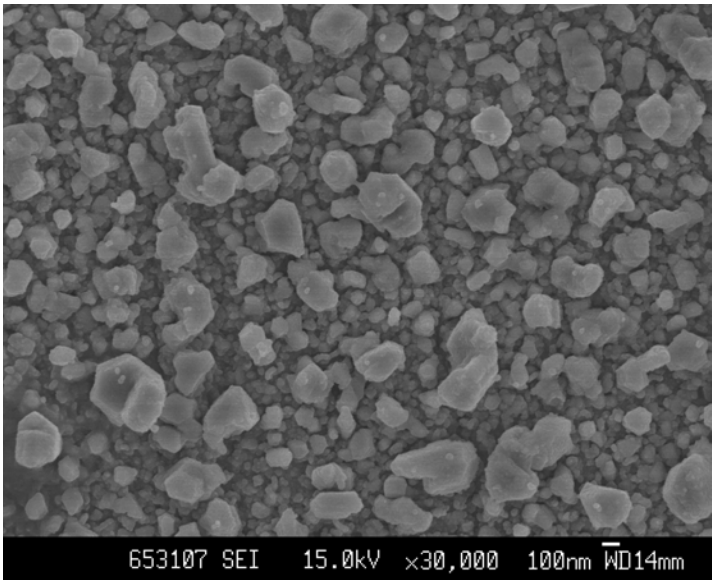


Fig. S3. SEM image of $Ce_xTb_{1-x}O_{2-\delta}$ nanoparticles (x=0.065).

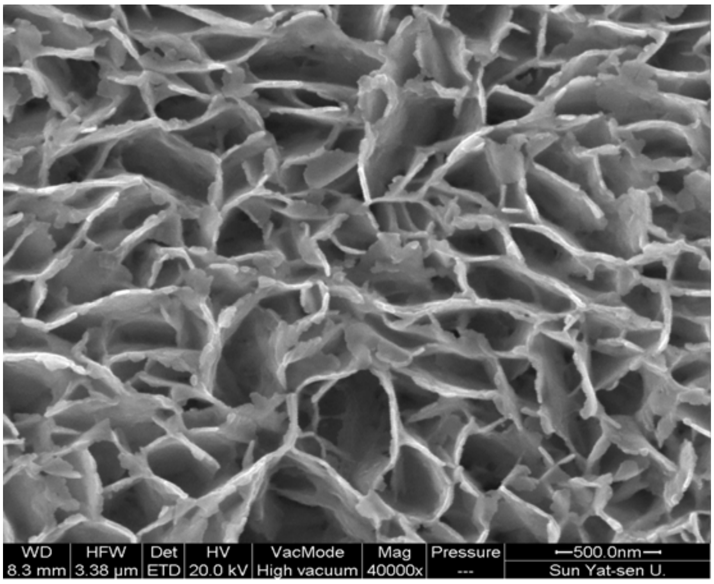


Fig. S4. SEM image of $Ce_xTb_{1-x}O_{2-\delta}$ nanosheets (x=0.065).

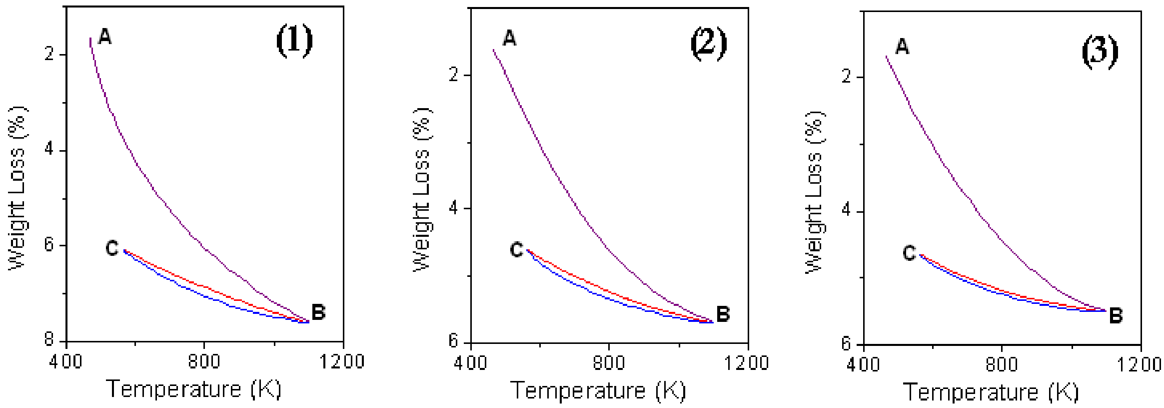


Fig. S5 Plot of weight loss (%) versus temperature between 450 and 1100 K, measured in flowing air for (1) $Ce_xTb_{1-x}O_{2-\delta}$ nanobelts, (2) $Ce_xTb_{1-x}O_{2-\delta}$ nanosheets, and (3) $Ce_xTb_{1-x}O_{2-\delta}$ nanoparticles. A to B, first heating cycle (Purple line); B to C, cooling (Red line); C to B, second heating cycle (Blue line).

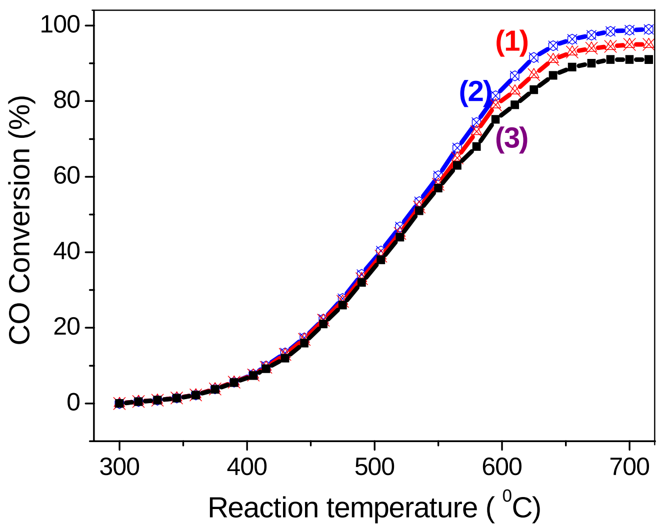
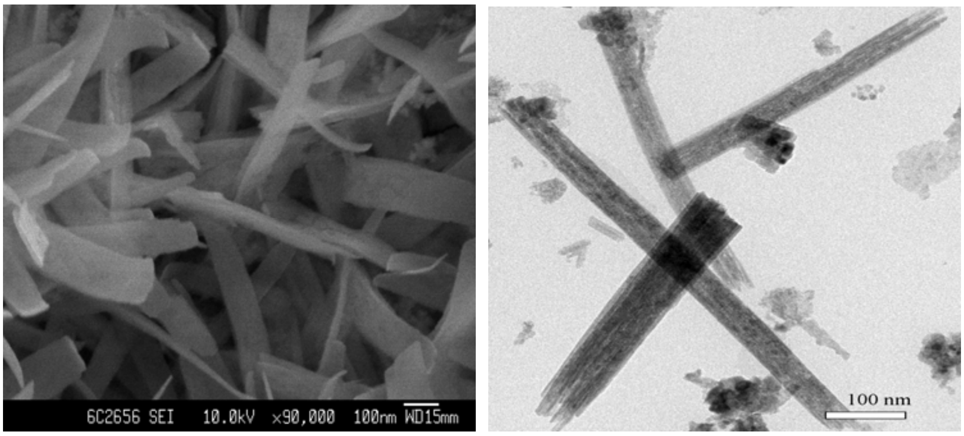


Figure S6. Conversion of CO over $Ce_xTb_{1-x}O_{2-\delta}$ nanobelts: (1) first time; (2) second time; (3) tenth time.



(a) (b)

Figure S7 (a) SEM and (b) TEM images of $Ce_xTb_{1-x}O_{2-\delta}$ nanoblets after recycling 10 times.

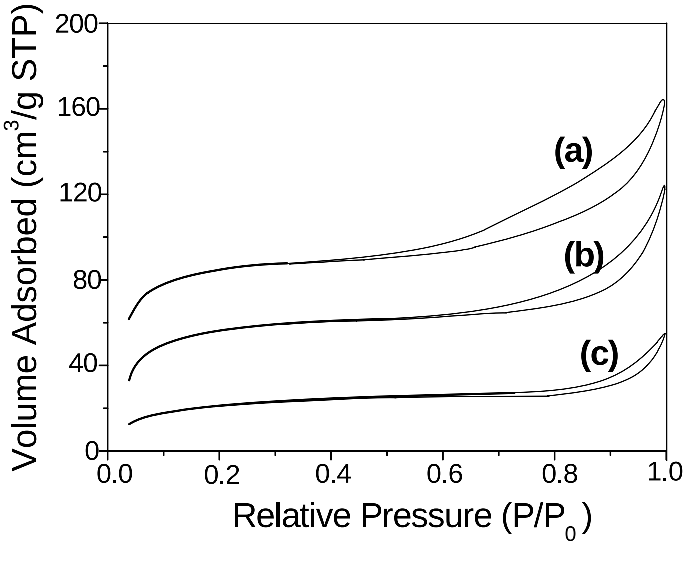


Figure S8. N_2 adsorption-desorption isotherms of $Ce_xTb_{1-x}O_{2-\delta}$ nanobelts (a), nanosheets (b), and nanoparticles (c).