Supporting Information

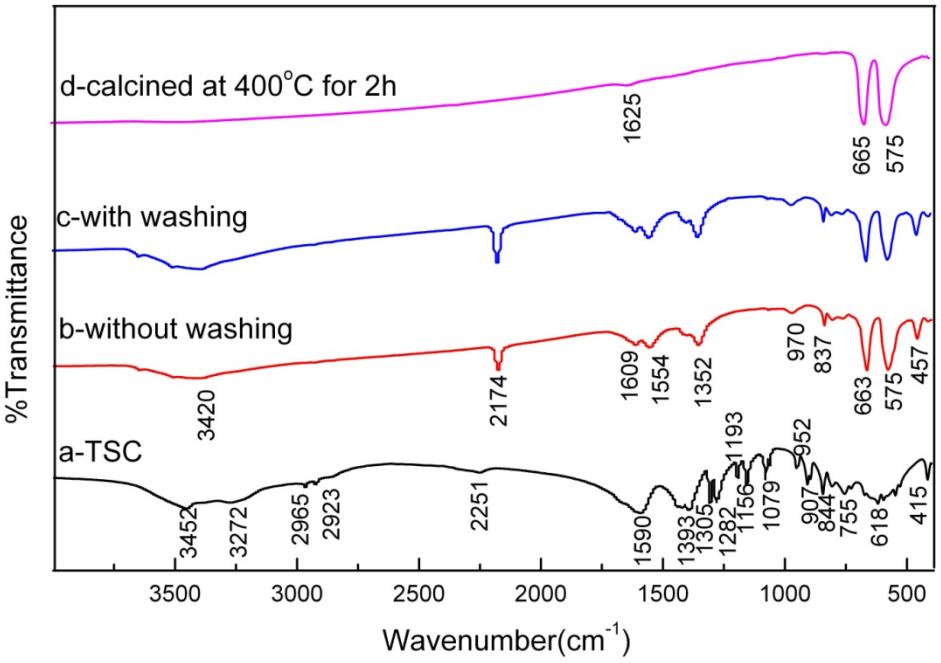

Fig. S1. Typical FTIR spectrum of the as-prepared products.

Infrared Fourier spectra shown in Figure S1b, c of the Supporting Information confirms adsorption of TSC on the dendritic precursor crystals. Compared with TSC, the bands at 1554, 1352, 970, and 457 cm^{-1} are indicative of the presence of TSC on the products before and after washing, while the broad band between 3300 and 3600 cm^{-1} and the band centered at 1609 cm^{-1} found on all samples are assigned to O-H stretching and deformation vibrations of weakly bound water. The band at 2174 cm^{-1} is stretching vibrations of OH groups in the presence of surface precursor that may result from the hydrothermal reaction at high temperature. On the basis of the analysis of the FT-IR spectrum, the strong adsorption of TSC on the surface of the dendrites can be concluded because the sample was washed by water and ethanol several times, and TSC is soluble in water, no free TSC can exist. When the negative polar facets are covered by TSC, the new nucleus could only attach on other facets, which may result

in oriented growth. Due to the slow growth rate, there is enough time for TSC to impact the newly formed surface. Finally, the dendritic structure is generated. The slow oriented growth mechanism of crystal is similar to the mechanism proposed by group Fang[1].

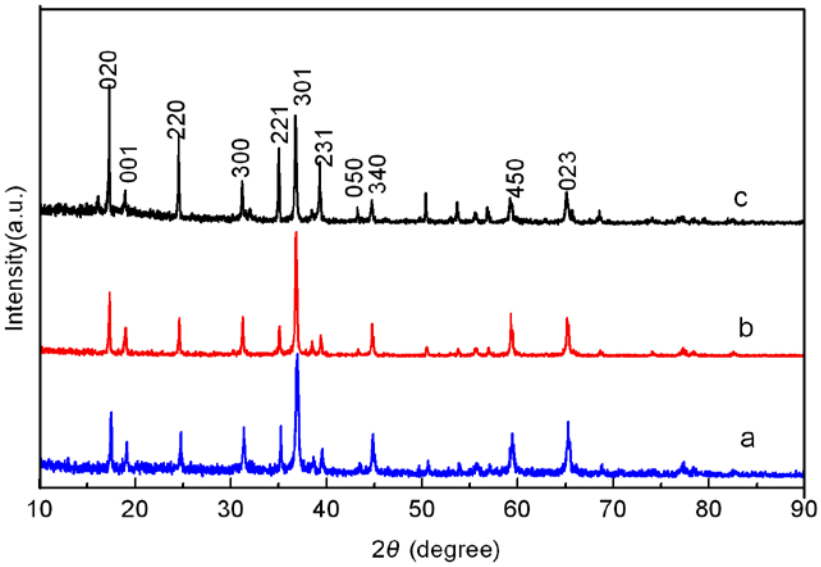

Fig.S2 Large-angle XRD patterns of the as-prepared precusors $Co(CO_3)_{0.5}(OH)_{0.11}H_2O$ nanodendrites.
a: 1.5h; b: 2h; c:24h

The XRD patterns all show characteristics of the cobalt-basic-carbonate phase, which is in good agreement with a reported compound, $Co(CO_3)_{0.5}(OH)_{0.11}H_2O$[17b,18], with lattice constants a = 8.79 Å, b=10.15 Å, and c=4.43 Å (space group $P22_12$). The crystal size was estimated according to the Scherrer fomula, their values are 28, 30, 38nm, respectively.

(1) [1] Fang, J.; You, H.; Kong, P.; Yi, Y.; Song, X.; Ding, B. *Cryst. Growth Des.* **2007**, *7*, 864.

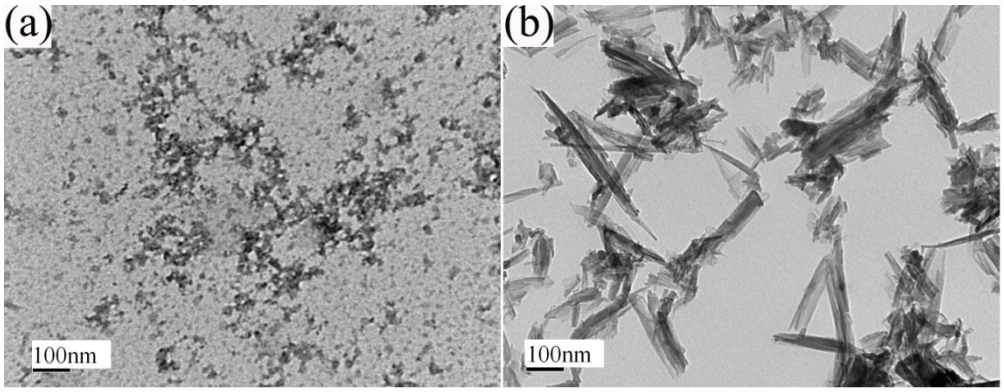

Fig. S3. Co_3O_4 nanostrucures obtained using different morphology-directors: (a) Sodium tartaric ($Na_2C_4H_4O_6 \cdot 2H_2O$); (b) Sodium alginate ($(C_6H_7O_8Na)_n$)