Supporting Information for:

Influence of $LaNiO_3$ shape on its solid-phase crystallization into coke-free reforming catalysts

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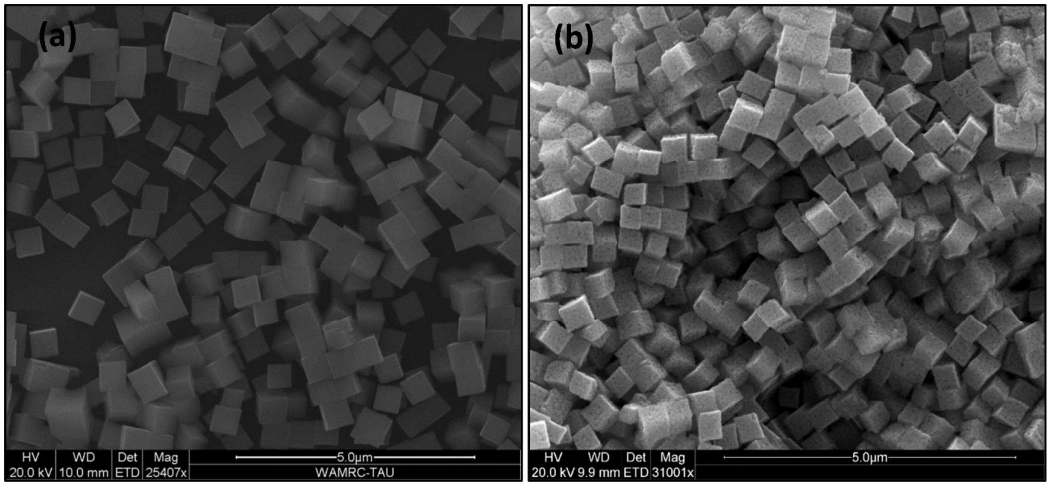

Figure S1: SEM micrographs of cube precursors (a) before (as-synthesized) and (b) after calcination at 650 ^{0}C ("fresh catalyst").

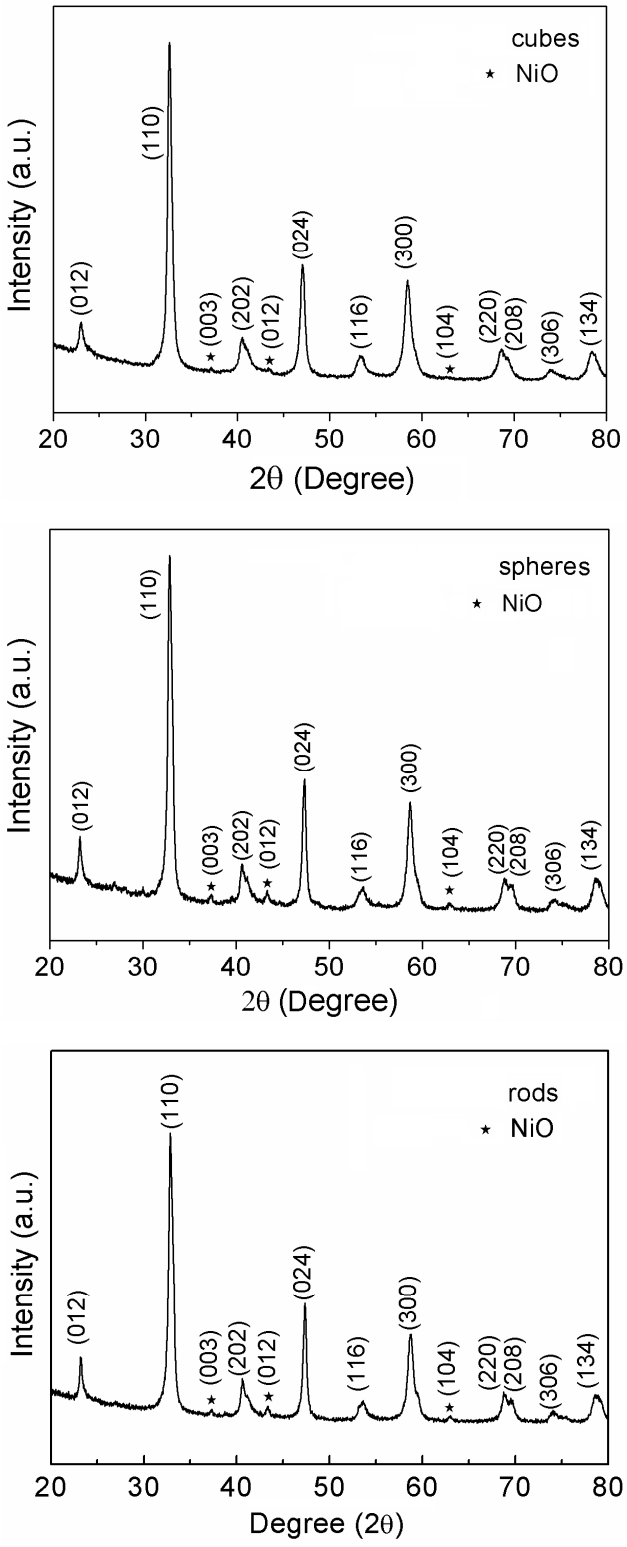

Figure S2: XRD patterns of $LaNiO_3$ cubes, spheres and rods with ~ 3 % NiO phase calcined at 650, 650 and 800 ^{0}C, respectively. All reflections not marked with a * are part of the Perovskite phase.

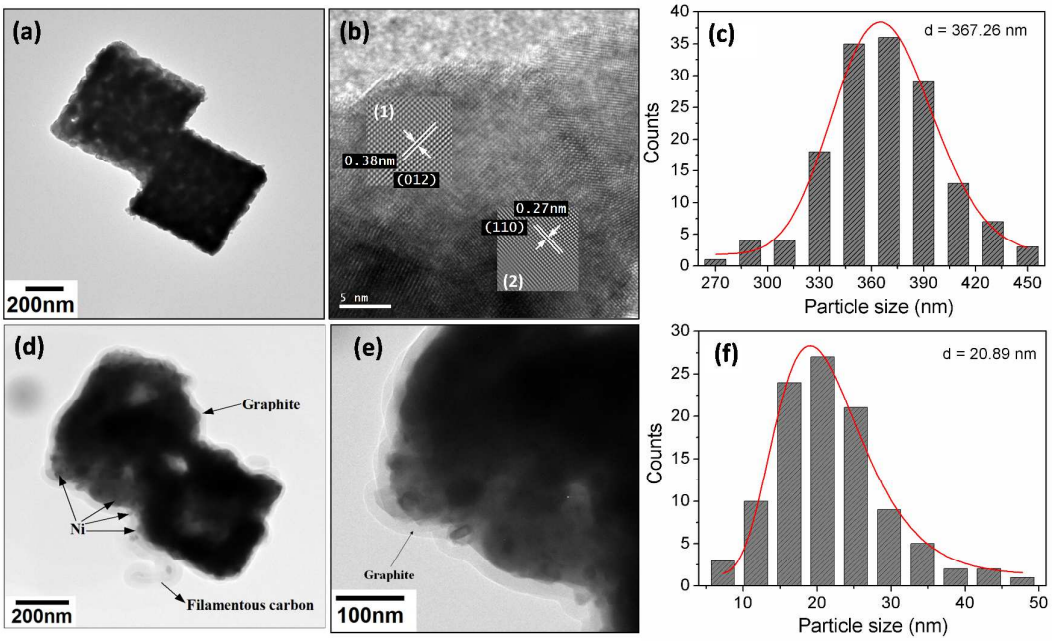

Figure S3: TEM micrographs of $LaNiO_3$ cubes at (a) low resolution, (b) high resolution images with crystallographic directions indicated (c) size distribution of $LaNiO_3$ Perovskite cubes (d) TEM images of spent cubes and (e) its corresponding high magnification images. (f) size distribution Ni-crystals exsolved from $LaNiO_3$ cubes.

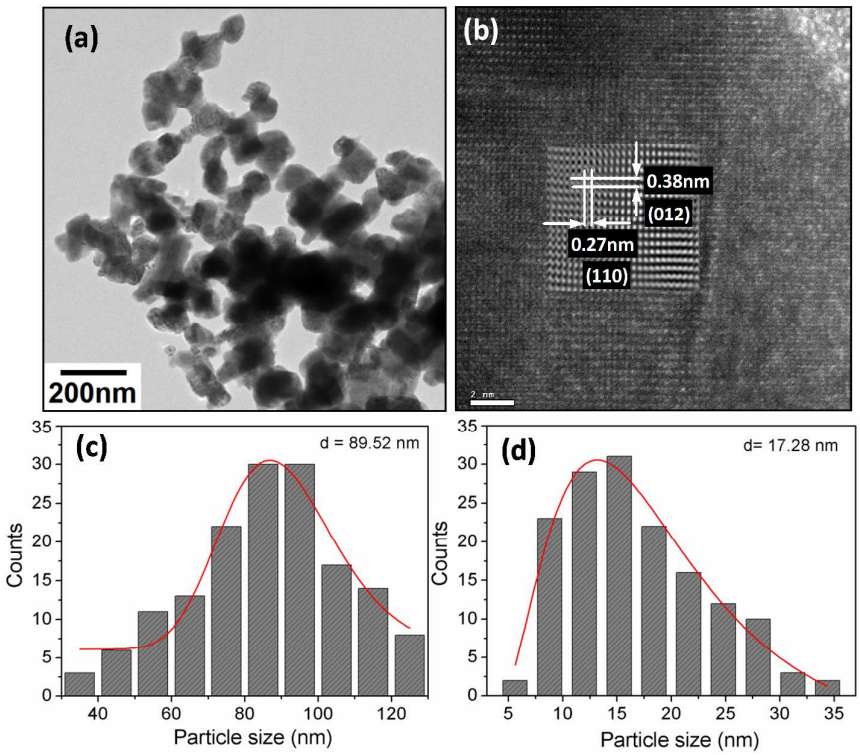

Figure S4: TEM micrographs of $LaNiO_3$ spheres at (a) low resolution, (b) high resolution, (c) size distribution of $LaNiO_3$ Perovskite spheres (d) size distribution Ni-crystals exsolved from $LaNiO_3$ spheres.

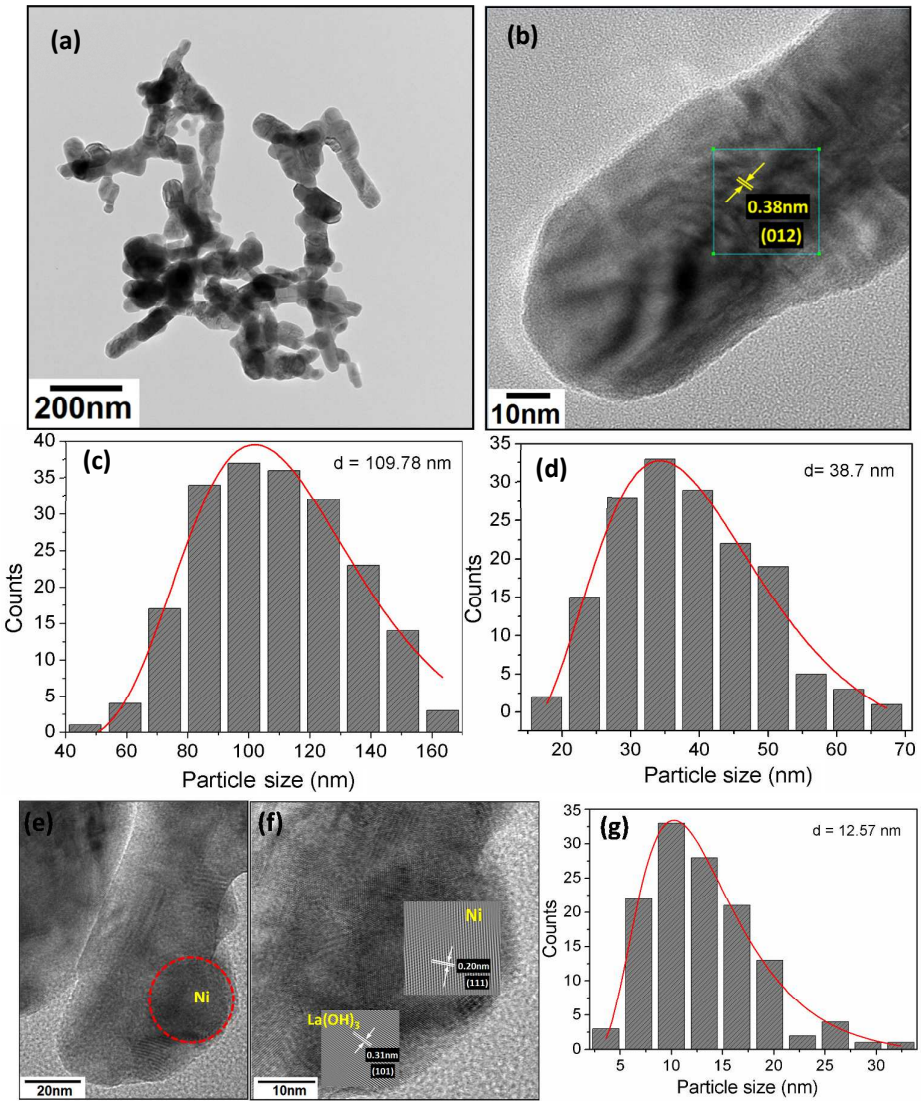

Figure S5: TEM micrographs of $LaNiO_3$ rods at (a) low resolution, (b) high resolution, (c) size distribution of rod in length and width, and (d) length (e) TEM image of spent rod at low and (f) high magnification (g) size distribution of Ni nanoparticles exsolved from $LaNiO_3$ rods.

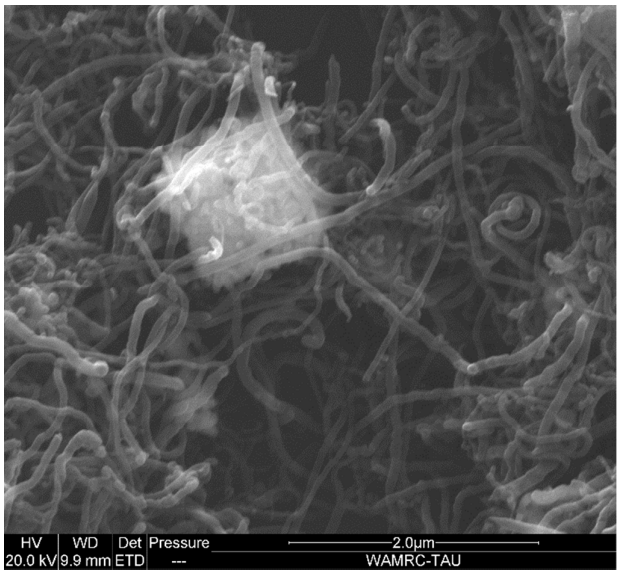

Figure S6: Carbon accumulation, mostly in the form of MWCNTs, found on catalyst exposed to a stoichiometric mixture of CO, CO_2, and H_2 defined by Equations (3) and (4).

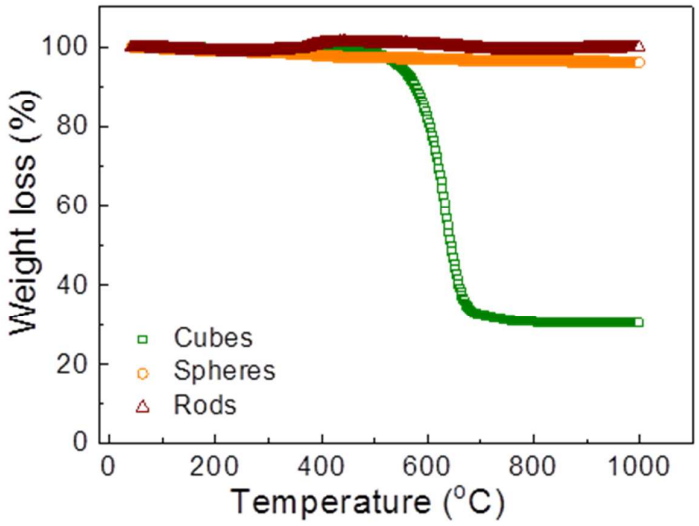

Figure S7: TGA plots of spent catalyst derived from cube-, sphere- and rod-shaped $LaNiO_3$. Samples were heated in an air atmosphere heating at 10K/min. Weight loss is indicative of carbon accumulation on the spent catalyst.

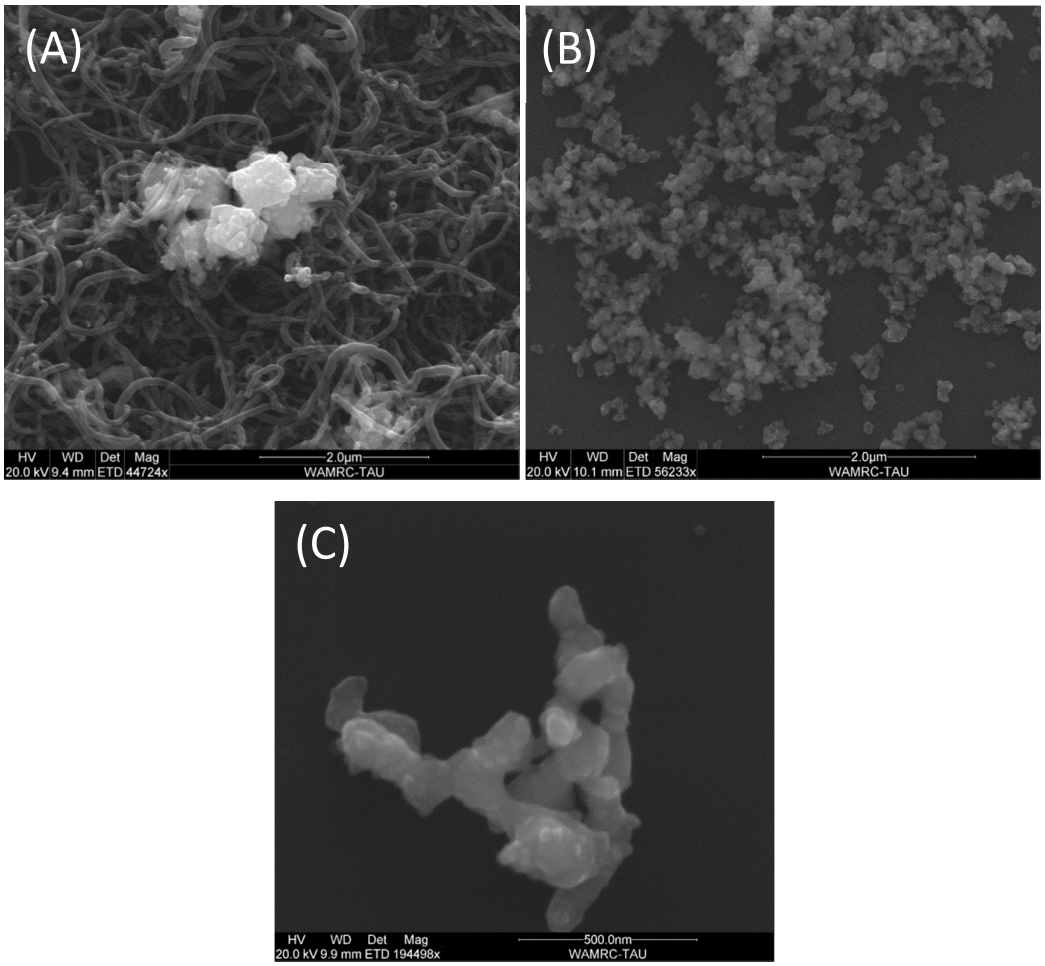

Figure S8: SEM images of spent catalysts derived from cube- (A), sphere- (B), and rod-shaped (C) Perovskite precursors. Severe carbon accumulation, mostly in the form of MWCNTs, is seen on the spent cube sample whereas the spheres and the rods remained coke-free under the same reaction conditions.

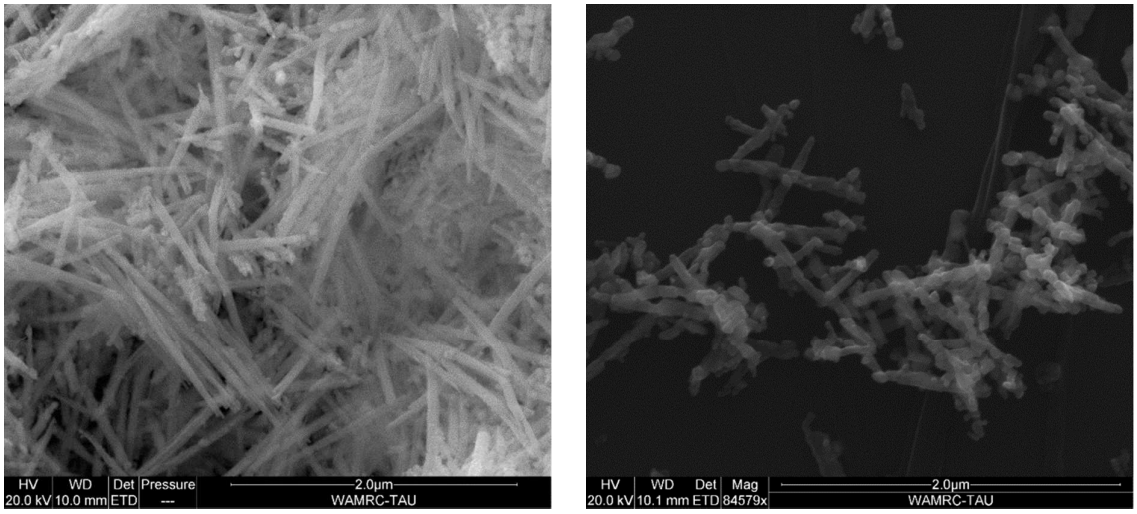

Figure S9: Fresh (left) and spent (right) rods derived from the Spinel structure showing no signs of carbon accumulation and comparable performance to their counterparts derived from the Perovskite structure.