Supporting information

3D and *in situ* electron microscopy study of the nucleation and growth processes of cobalt-based nanoparticles synthesized by thermal decomposition on carbon nanotubes

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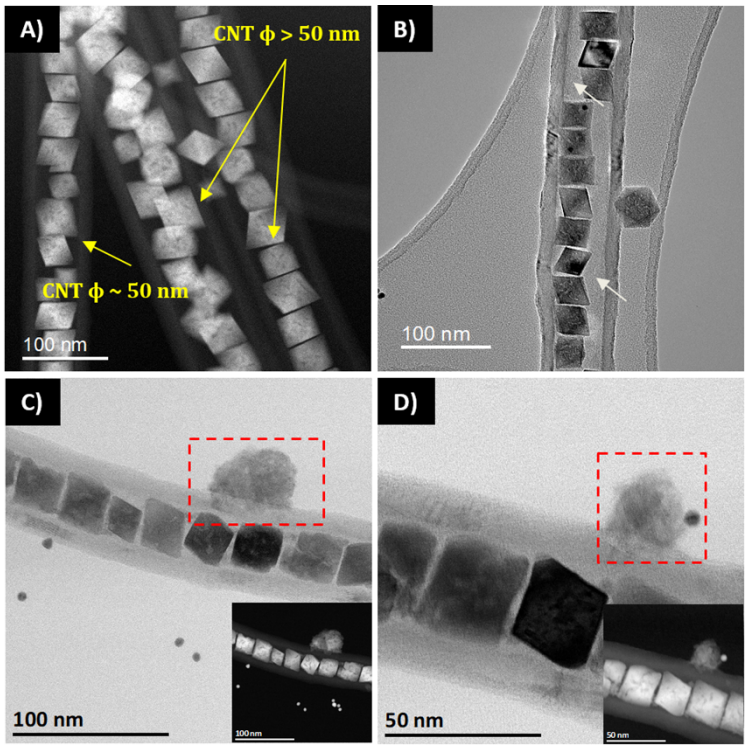

Figure S1. ADF STEM (A), TEM (B) and BF STEM (C-D) images of the Co-based NPs synthesized inside the CNT channels; few ones are anchored at the external surface.

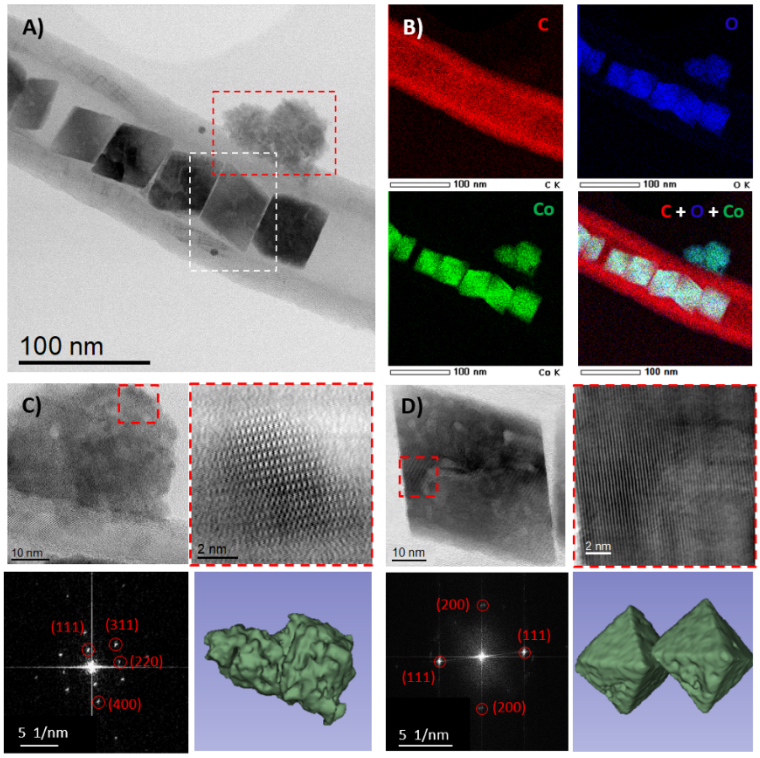

Figure S2. A) BF STEM image of the Co-based@CNT particle present in Figure 1. B) EDS maps of C, O and Co of the Co-based@CNT present in A). HR-STEM images, FFT micrographs and 3D models of typical Co-based NPs localized outside C) and inside D) the CNT channel as shown in A).

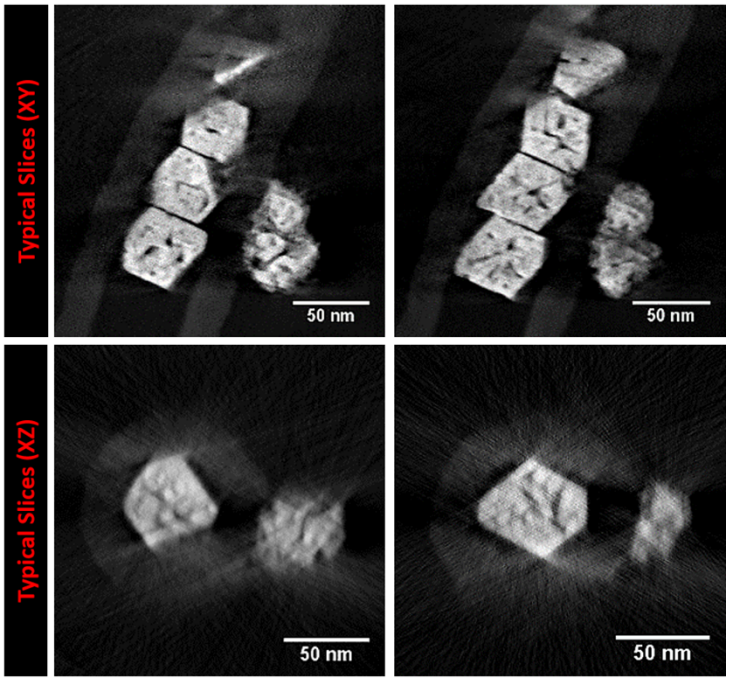

Figure S3. Typical (XY) and (XZ) slices extracted from the 3d volume calculated by tomography of Co-based/CNT grain present in Figure 1.

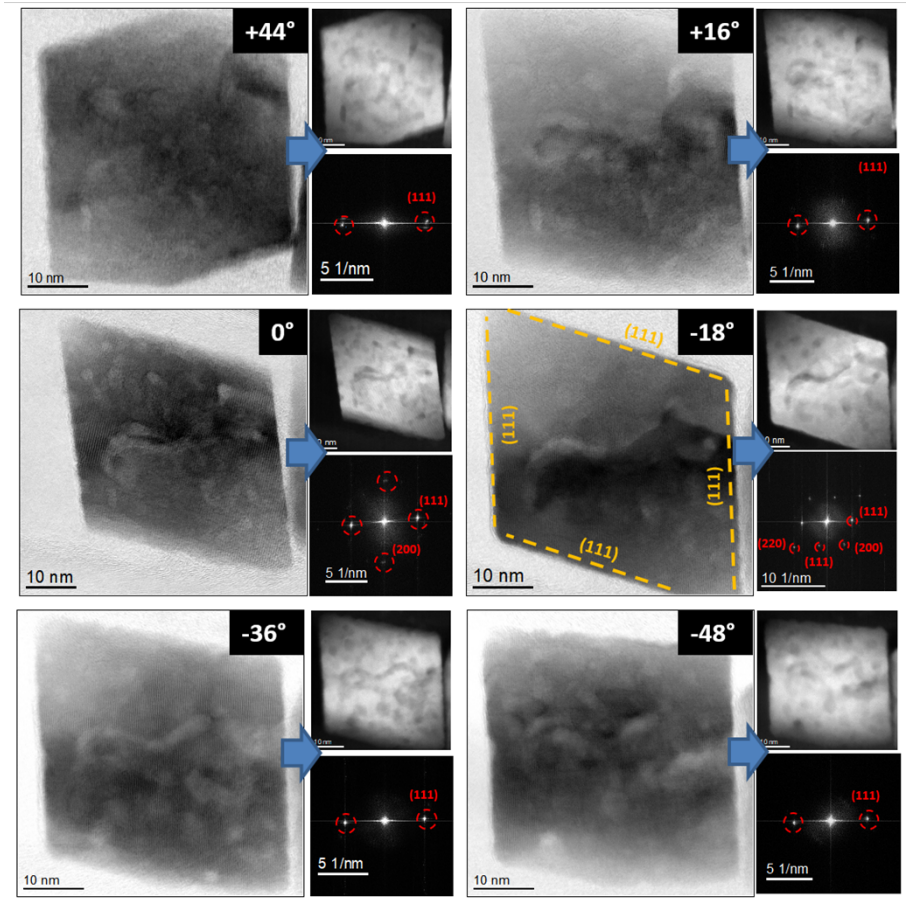

Figure S4. Identification of crystallographic facets of a typical CoO@CNT particle using STEM-HR images correlated with corresponding FFT micrographs between +44° and -48° from the initial position on the TEM grid.

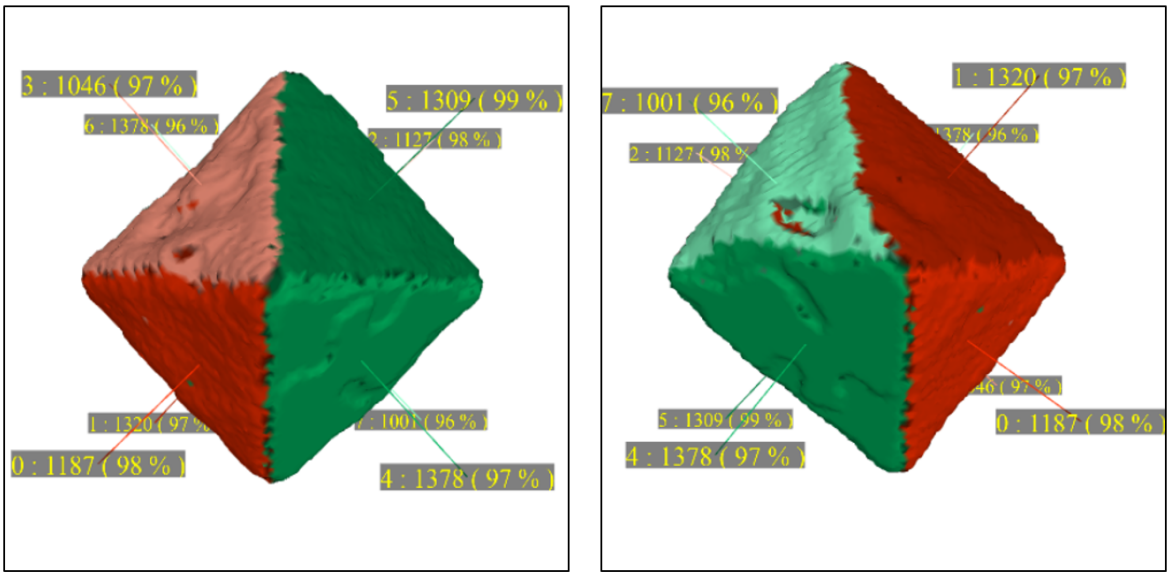

Figure S5. 3d model of typical Co-based NPs filled in the CNT with quantified facets using tomographic approach.

Table S1. 3D surface quantification of typical CoO particle synthesized inside the CNTs channels.

Facets	Total surface of the facet (pixel) ^{2}	Well-defined surface (without deviated surface at the edges) (pixel) ^{2}	Deviated surface (pixel)^2
1	1043	1001	42
2	1078	1046	32
3	1150	1127	23
4	1211	1187	24
5	1322	1309	13
6	1361	1320	41
7	1420	1378	42
8	1435	1378	57
∑	**10020**	**9746**	**274**