ADVANCED FUNCTIONAL MATERIALS

# Supporting Information

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# Solute Incorporation at Oxide–Oxide Interfaces Explains How Ternary Mixed-Metal Oxide Nanocrystals Support Element-Specific Anisotropic Growth

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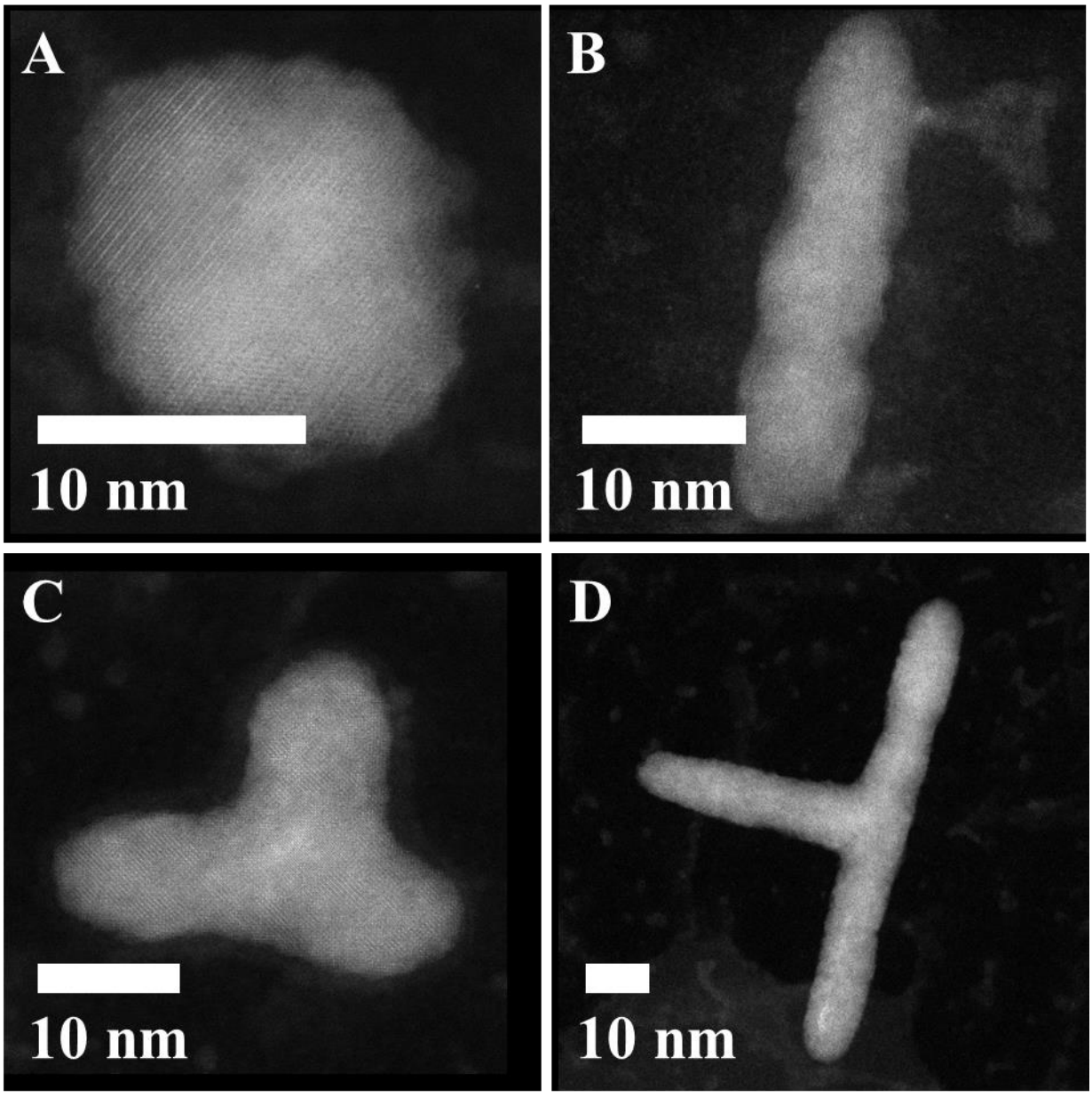


**Figure S1** HAADF-HRTEM images corresponding to the HAADF HRTEM-EDX mappings of MnCoO NPs after 1 min (A), 5 min (B), 10 min (C), and 30 min (D) reaction time.

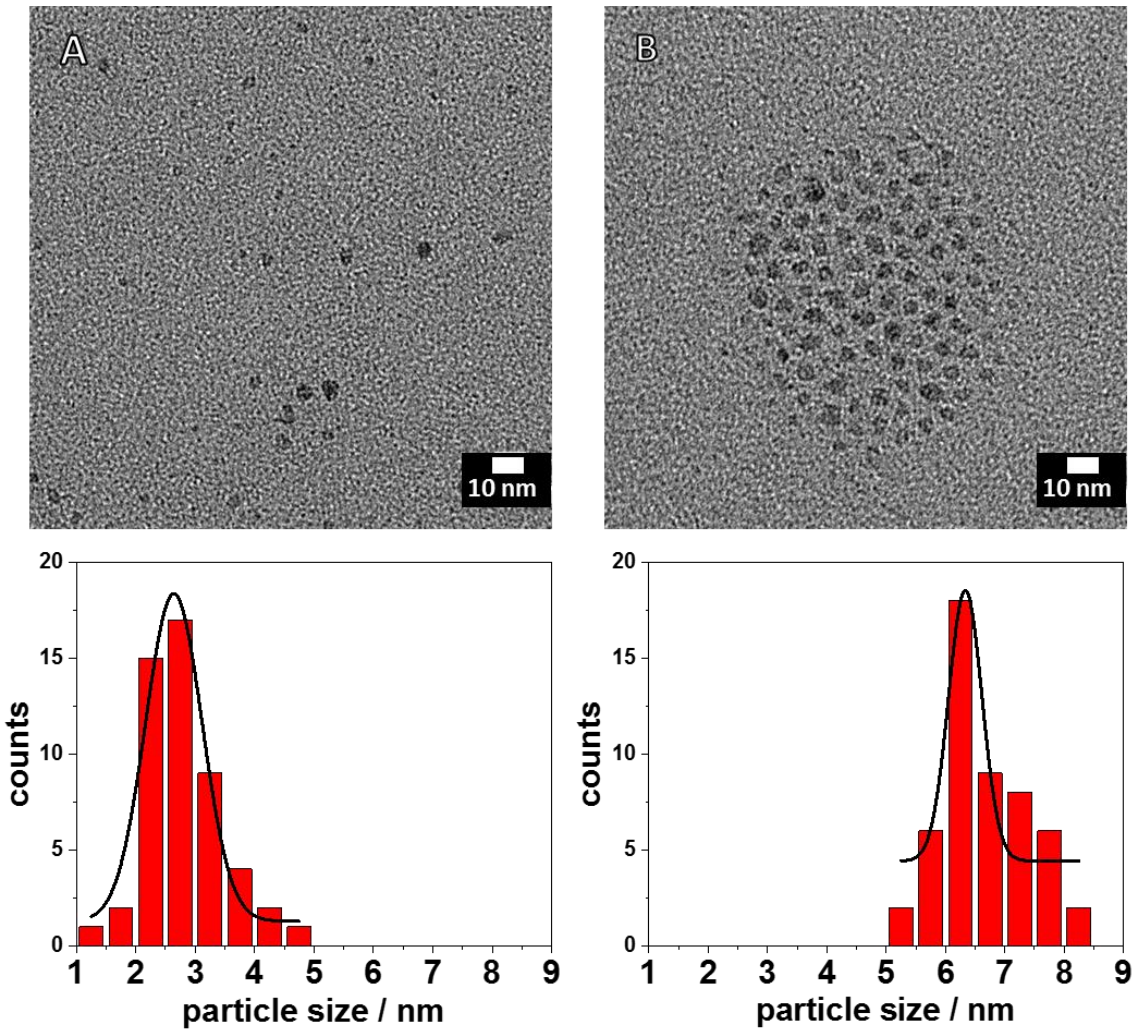


**Figure S2** BF-Images of MnCoO-NP with 56 at. % Co taken at 295 °C (A) and after 0.1 min at the reaction temperature of 300 °C (B).

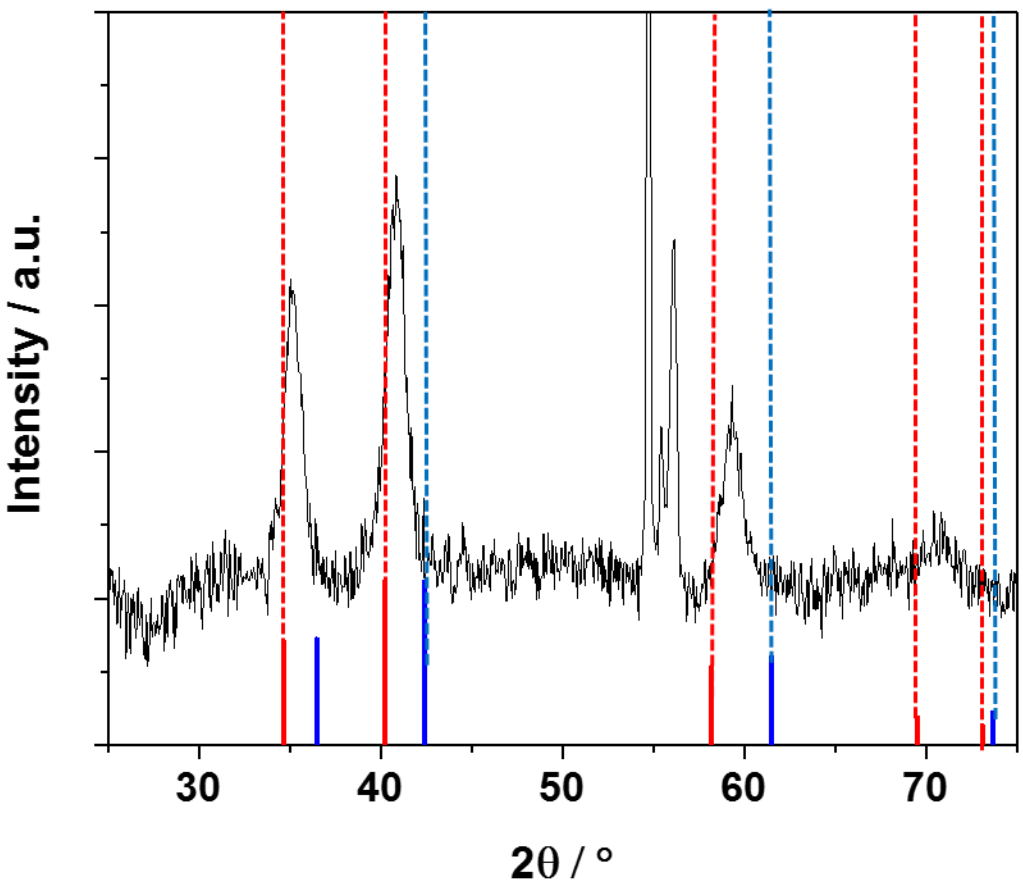


**Figure S3** X-ray diffraction patterns of Mn50Co50O after 0.1 min reaction time. The lattice spacing along [220] is 1.493 Å, which can be assigned to a Co content of approximately 10%. PDF#00-048-1719 (CoO) and PDF#01-072-1533 (MnO) are displayed as references. The three reflections between 54 ° and 57 ° originate from the Si substrate.

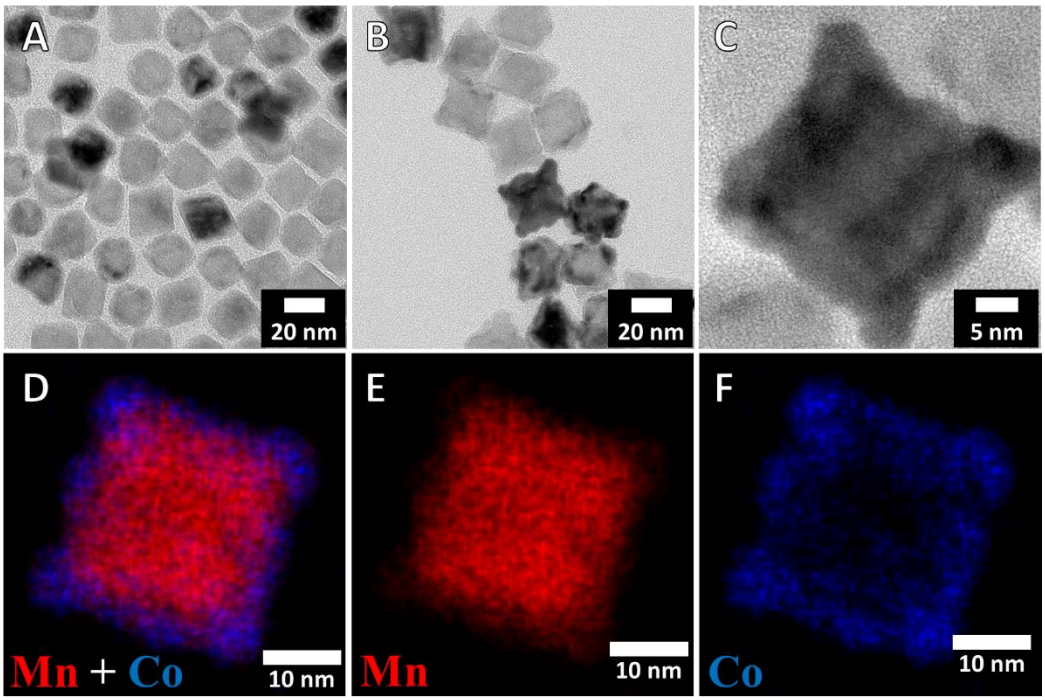


**Figure S4** TEM image of cuboctahedral MnO NCs obtained after 2 min reaction time at the reaction temperature of 300 °C, before injection of Co-oleate precursor (A), MnCoO-NPs with outgrowth arising from the corners after 30 min reaction time (B,C). The corresponding HAADF-STEM-EDX mappings are shown at the bottom (D, E, F) showing a Mn-rich core and Co enrichments in the outer sections, especially at the corners and edges. Outgrowth arising from the corners clearly consists of both elements. These samples were prepared in a two-step synthesis, where first the reaction was run with Mn-oleate precursor and after 2 min reaction time at reaction conditions the Co-oleate precursor was injected.

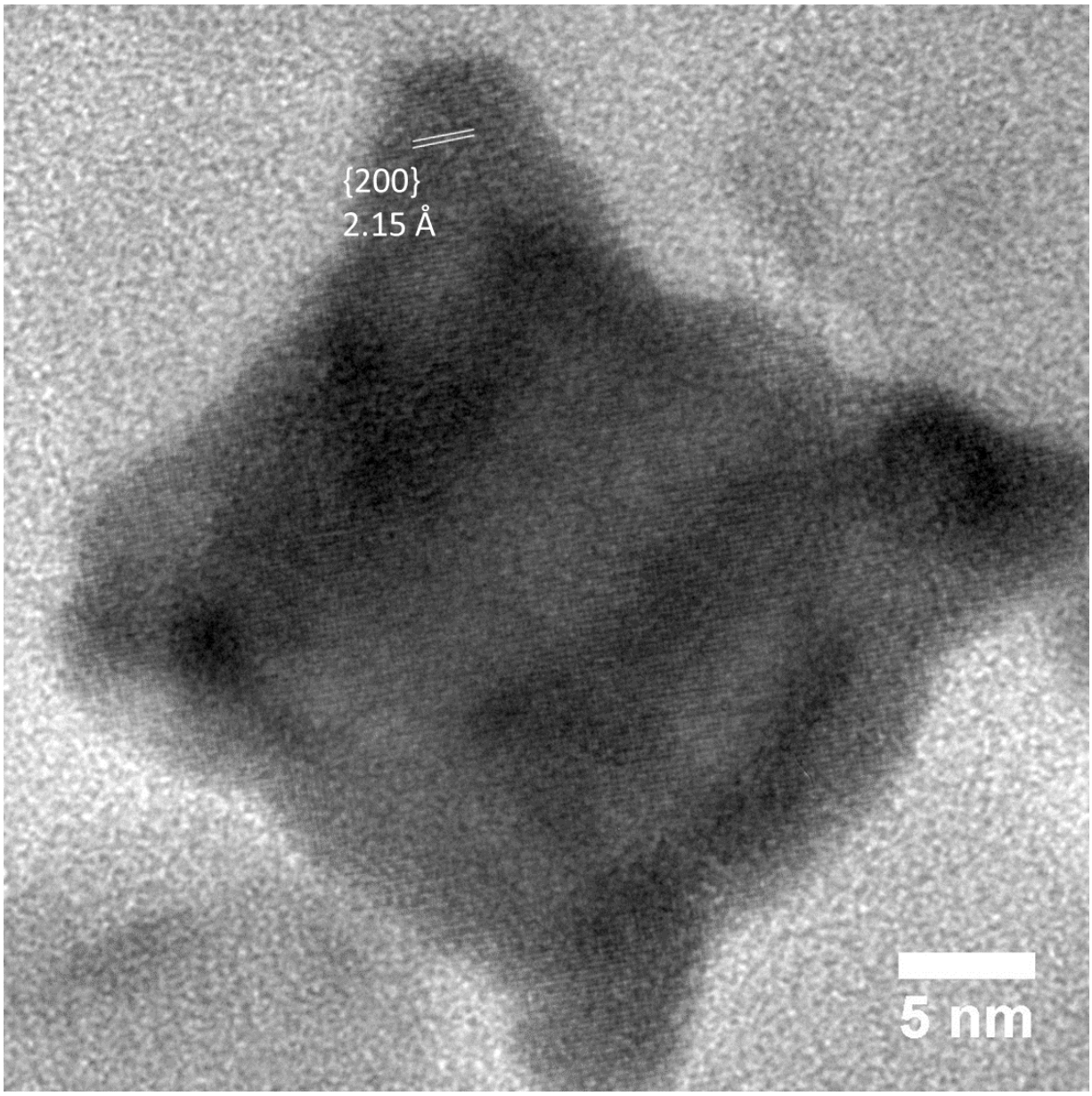


**Figure S5** HRTEM image of a cubic MnCoO NCs with outgrowth arising from the corners, prepared in a two-step synthesis. Consistent lattice planes are visible throughout the whole particle.

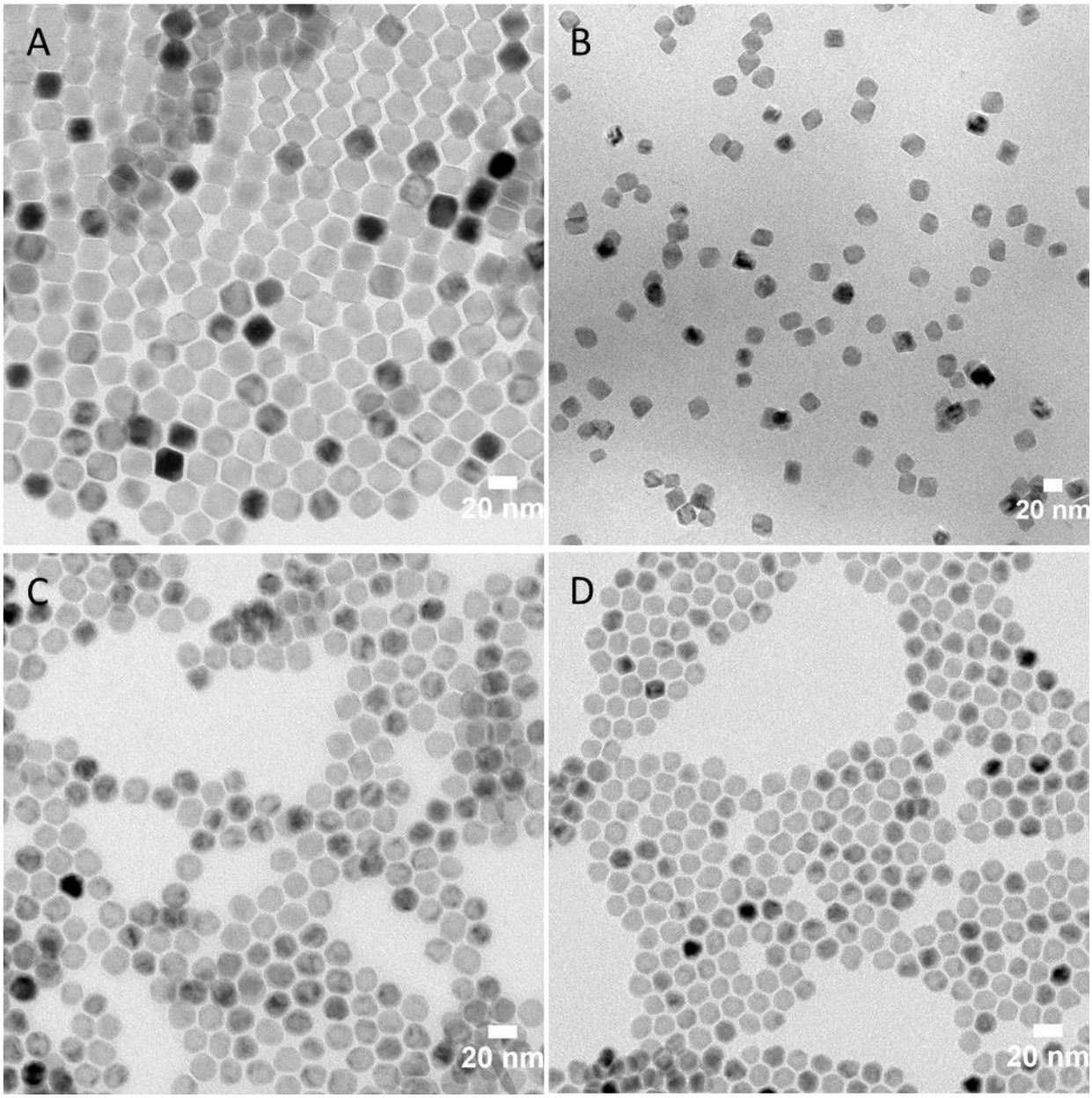


**Figure S6** TEM-images of cuboctahedral MnO-NPs prepared without oleic acid (A), and with addition of 0.46 mL (B) 0.92 mL (C) and 1.84 mL (D) oleic acid. The particle size and shape remains constant, except that with increasing oleic acid concentration the edges of particles become less defined.

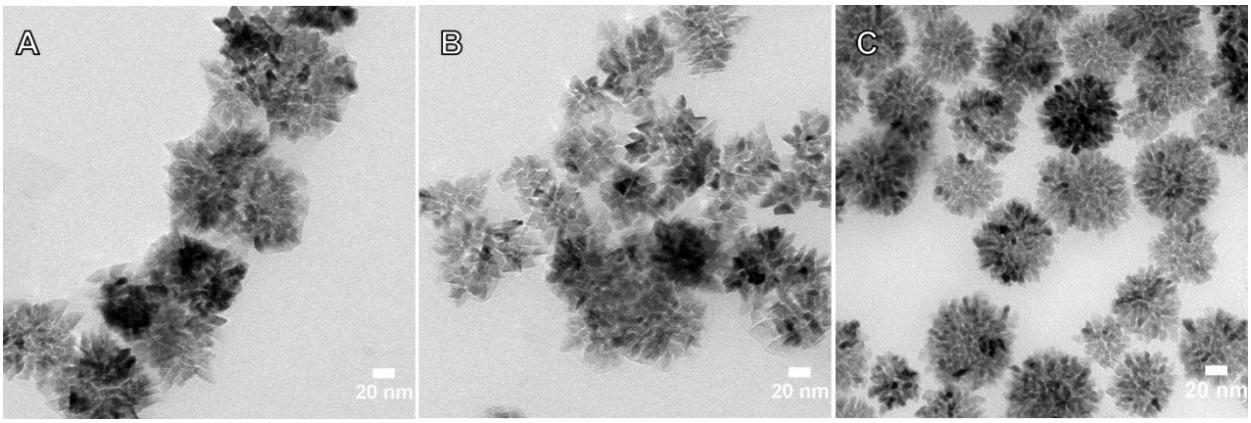


**Figure S7** TEM-images of CoO-NP prepared without oleic acid (A), and with addition of 0.46 mL (B) and 1.84 mL (C). The type of agglomeration remains constant. With increasing oleic acid concentration the edges of the particles become less defined. No predominant shape of the individual nanocrystals can be identified at high OA concentrations.

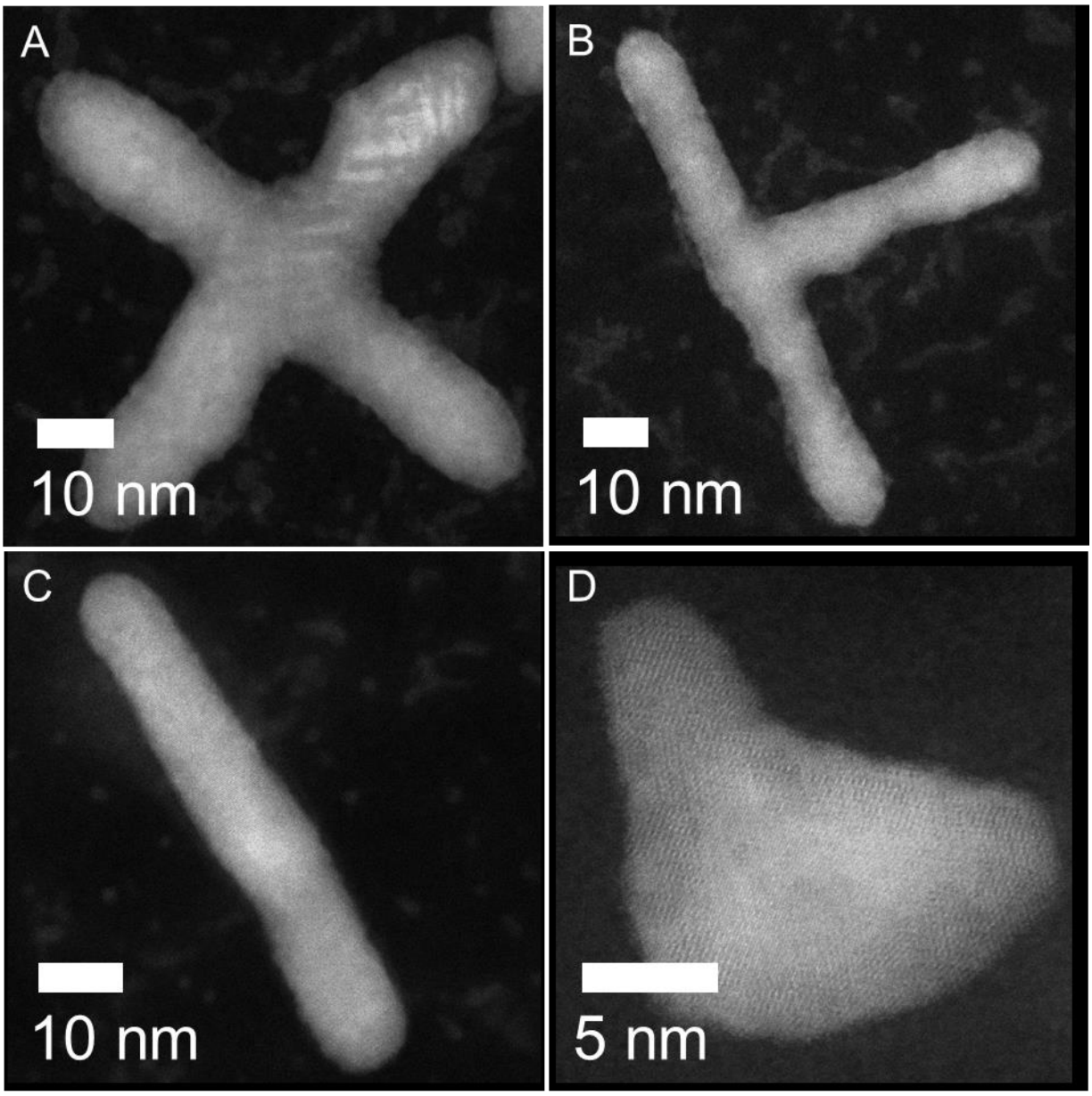


**Figure S8** HAADF-HRTEM images corresponding to the HAADF HRTEM-EDX mappings MnCoO NPs with Co contents of 12 at.%(A), 41 at.%(B), 56 at.% (C) and 75 at. % (D).

**Table S1.** Crystal domain sizes calculated from FWHM via Scherrer Equation with (K=0.9)

| sample | crystal domain Size (nm) |
|---|---|
| Mn88Co12 | 12.7 |
| Mn76Co24 | 9.6 |
| Mn59Co41 | 10.0 |
| Mn44Co56 | 12.2 |
| Mn25Co75 | 11.4 |
| Mn5Co95 | 23.1 |