SUPPLEMENTARY INFORMATION

Enhanced coercivity in Co-rich near
stoichiometric $\text{Co}_x\text{Fe}_{3-x}\text{O}_{4+\delta}$ nanoparticles
prepared in large batches

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1 S1. Determination of composition

As mentioned in Section 4 the formula unit composition of non-stoichiometric cobalt ferrite can be written as

$$(\text{Co}_y\text{Fe}_{1-z-u}^{\text{III}}\text{Fe}_u^{\text{II}})[\text{Co}_{x-y}\text{Fe}_v^{\text{II}}\text{Fe}_{2-x+z-v}^{\text{III}}]\text{O}_{4+\delta} \quad (1)$$

with an inversion degree defined as $\Delta \equiv 1 - z - u$. However, the analysis of the Mössbauer data indicated a negligible amount of Fe^{II} species, i.e., $u = v = 0$, which simplifies the formula unit composition to

$$(\text{Co}_y\text{Fe}_{1-z}^{\text{III}})[\text{Co}_{x-y}\text{Fe}_{2-x+z}^{\text{III}}]\text{O}_{4+\delta} \quad (2)$$

with an inversion degree thus defined as $\Delta \equiv 1 - z$.

Hence, to determine the three compositional variables x, y, z we can use the three ratios determined by different techniques: A) the chemical composition ratio, $CR \equiv [\text{Fe}^{(2,3)+}]/[\text{Co}^{2+}]$, substituting the values from Eq. 2 gives

$$CR = \frac{2 - x + z + 1 - z}{x - y + y} = \frac{3 - x}{x} \Rightarrow x = \frac{3}{CR + 1} \quad (3)$$

B) the iron distribution ratio, $MS \equiv \text{Fe}^{[\text{B}]} / \text{Fe}^{(\text{A})}$, taking the values from Eq. 2 we obtain

$$MS = \frac{2 - x + z}{1 - z} \Rightarrow z = \frac{MS + x - 2}{MS + 1} \quad (4)$$

and finally C) the occupancy ratio of metal cations distributed in the octahedral and tetrahedral places, $BA \equiv [\text{B}]/(\text{A})$, using the values from Eq. 2 yields

$$BA = \frac{x - y + 2 - x + z}{1 - z + y} = z = \frac{2 - y + z}{1 - z + y} \Rightarrow y = \frac{2 + z + z \cdot BA - BA}{BA + 1} \quad (5)$$

Table 2 shows the compositions determined for various samples.