Supplementary information

Impact of inversion and non-stoichiometry on the transport properties of mixed zinc-cobalt ferrites

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Synthesis details

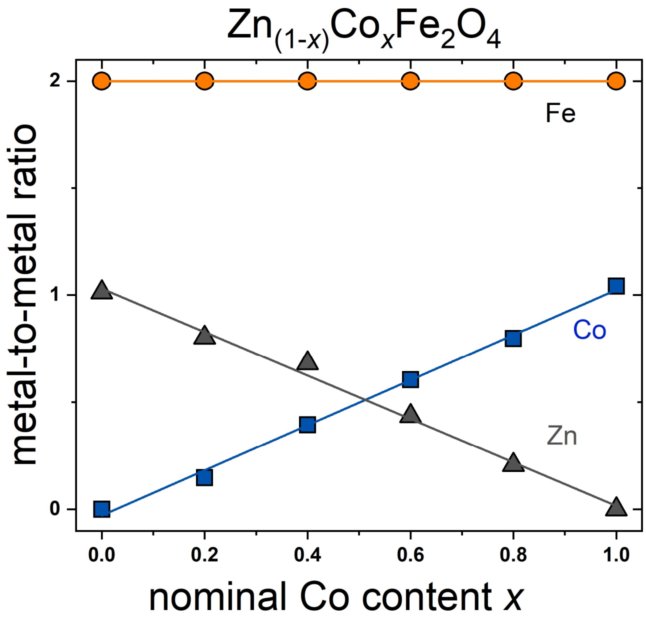
TableS1 shows the stoichiometric amounts of the metal precursors and oxalic acid dihydrate used for the hydrothermal synthesis.

TableS1: List of prepared $Zn_{(1-x)}Co_xFe_2O_4$ samples with the molar amounts of the different precursors.

Sample	***x***	**$FeCl_3 \cdot 6\ H_2O$ /mmol**	**$C_2H_2O_4 \cdot 2\ H_2O$ /mmol**	**$Zn(acac)_2$ /mmol**	**$CoCl_2 \cdot 6\ H_2O$ /mmol**
$ZnFe_2O_4$	0	1.05	2.09	0.52	0
$Zn_{0.8}Co_{0.2}Fe_2O_4$	0.2	1.05	2.09	0.42	0.11
$Zn_{0.6}Co_{0.4}Fe_2O_4$	0.4	1.05	2.09	0.31	0.21
$Zn_{0.4}Co_{0.6}Fe_2O_4$	0.6	1.05	2.09	0.21	0.31
$Zn_{0.2}Co_{0.8}Fe_2O_4$	0.8	1.05	2.09	0.11	0.42
$CoFe_2O_4$	1	1.05	2.09	0	0.52

Inductive Coupled Plasma Mass Spectrometry ICP-MS:

ICP-MS was used to determine the bulk sample composition of the specimens with a general formula of $Zn_{(1-x)}Co_xFe_2O_4$. In order to achieve a better comparability with the expected composition, the results were normalized to a stoichiometric iron value of 2 and reported in **Figure S1**.



FigureS1: *Comparison of the metal to metal ratios, determined by ICP-MS. The amount of iron was set as 2 and cobalt and zinc were normalized accordingly.*

The measured sample compositions show no discrepancy between experimental and expected stoichiometry, confirming that the chosen synthesis route ensures a high control of the stoichiometry of the synthesized samples. Hence, it is justified to make statements about the influence of the cobalt or zinc content on the structural and transport properties based on this sample series.

Activation energy as a function of temperature at reducing conditions

In **Figure S2**, the activation energy of $Zn_{0.4}Co_{0.6}Fe_2O_4$ and $CoFe_2O_4$ under reducing conditions is plotted as a function of temperature. At high temperatures (T > 300 °C), the activation energy increases due to the onset of the reduction reaction.

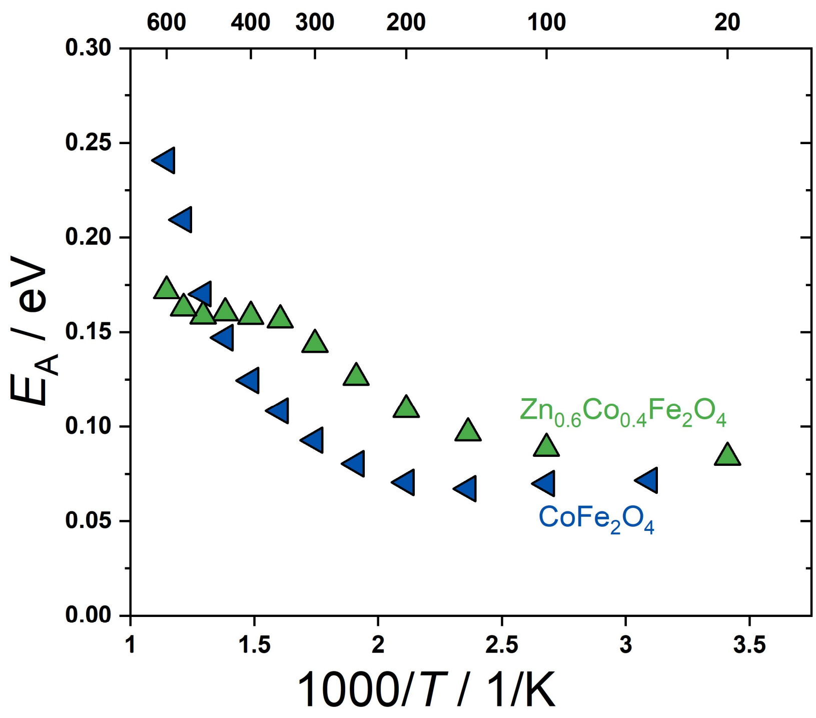


Figure S2: *Increase of the activation energy at high temperatures (T > 300 °C), here shown for $Zn_{0.6}Co_{0.4}Fe_2O_4$ and $CoFe_2O_4$ at reducing atmosphere ($p = 2 \cdot 10^{-4}$ mbar). The activation energies are determined from the derivation of the Arrhenius plots.*