Sintering and Electrical Conductivity of Medium- and High-Entropy Calcium-doped Four-Cation Perovskite Materials

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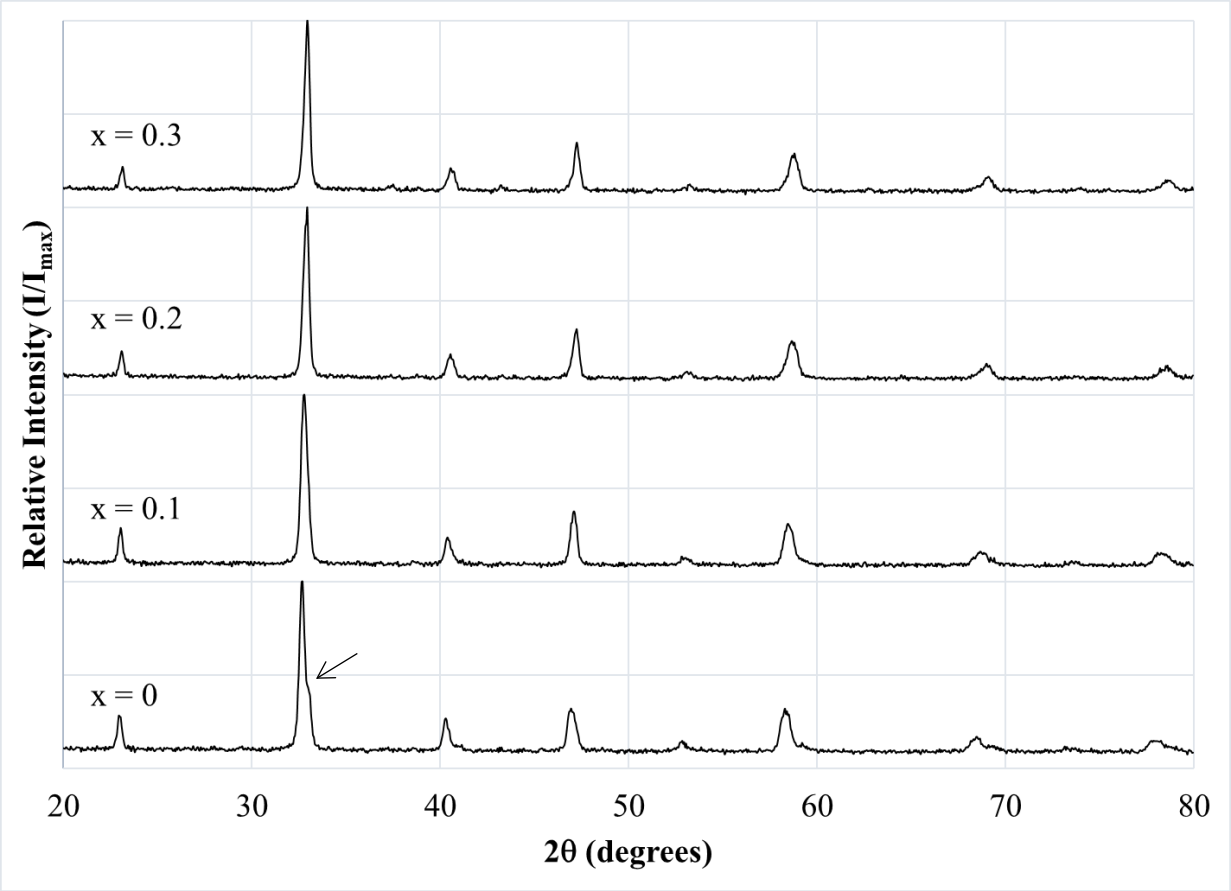


Figure S1. XRD spectra for $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$, for x = 0 to 0.3. Conversion of starting materials to single-phase perovskite is indicated by presence of only perovskite peaks. Arrow indicates an acromion in the x = 0 spectrum, which is absent from the calcium-doped materials.

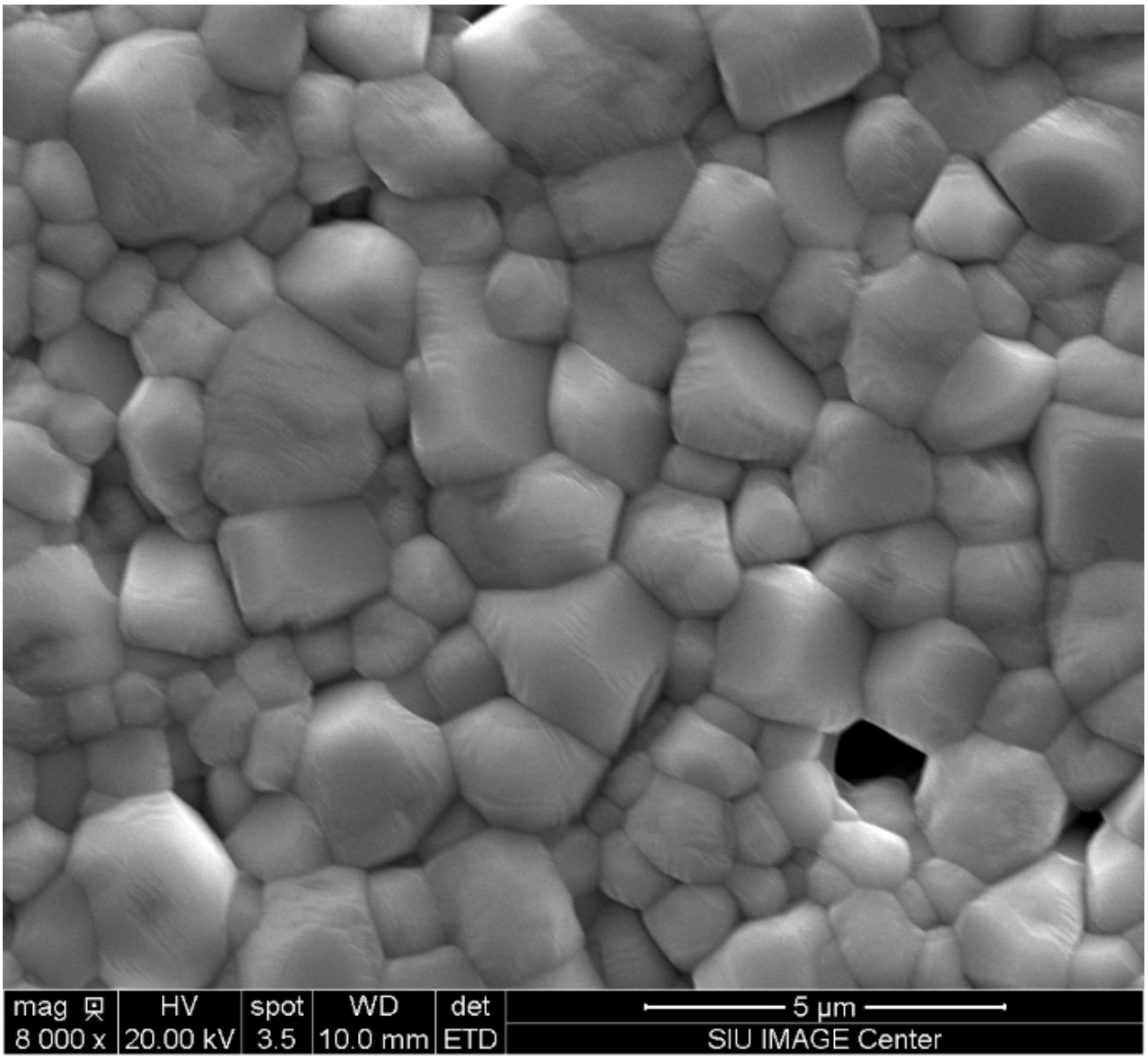


Figure S2. Microstructure for undoped $La(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ sintered at 1400°C for 2 h in air.

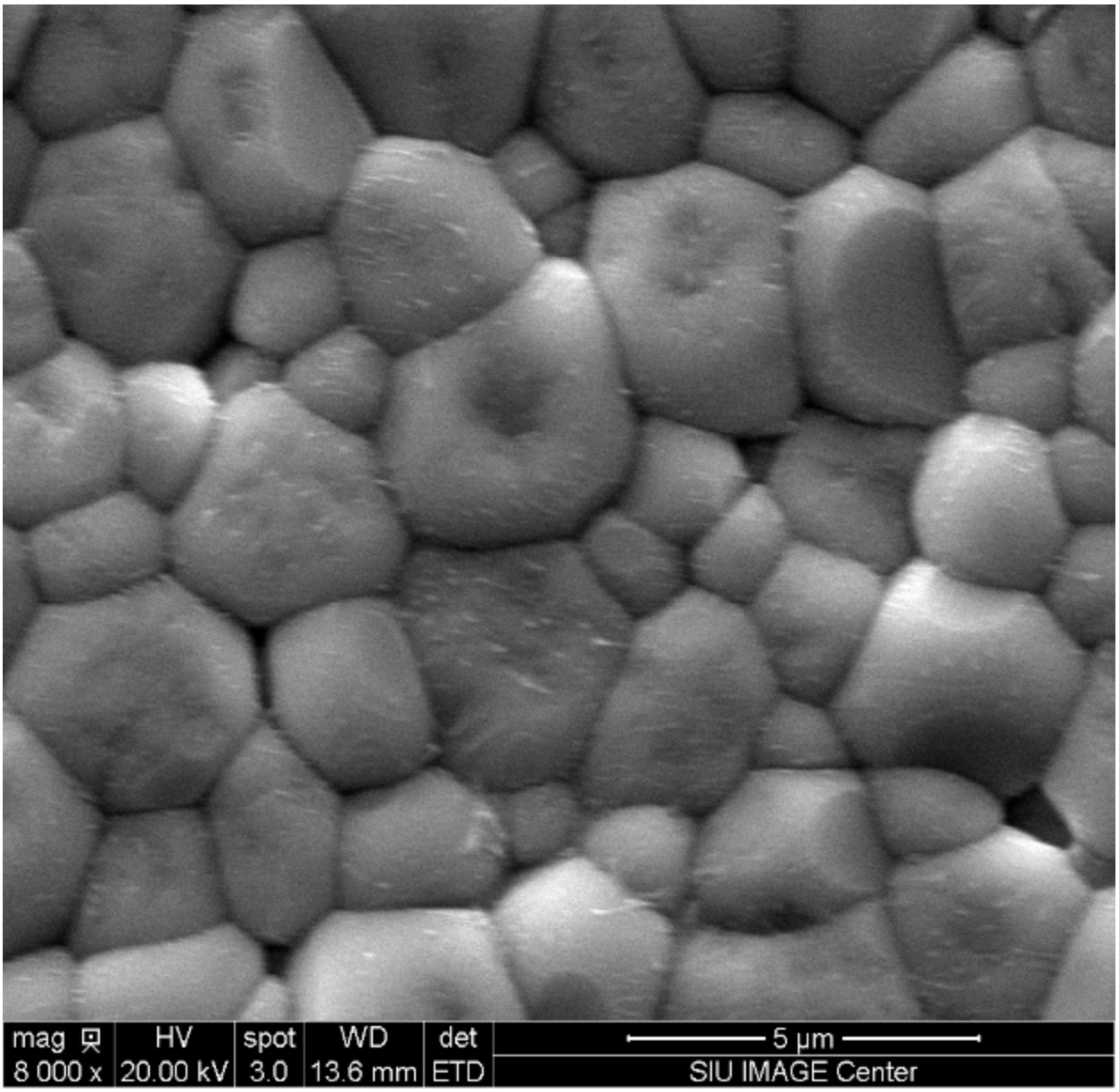


Figure S3. Microstructure for Ca-doped (x = 0.1) $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ sintered at 1400°C for 2 h in air. Small particles on the surface are remnants from the polishing operation.

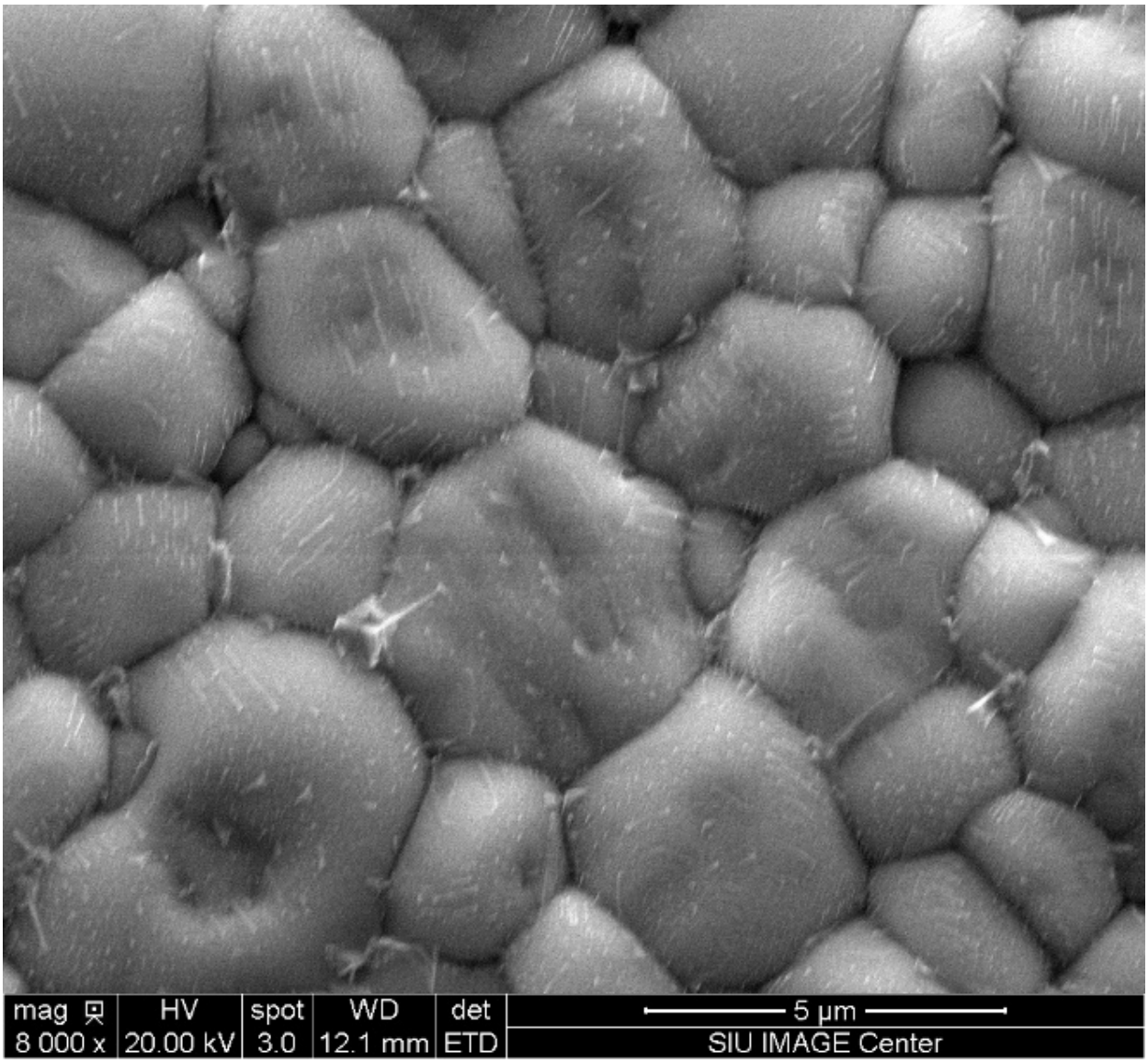


Figure S4. Microstructure for Ca-doped (x = 0.2) $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ sintered at 1400°C for 2 h in air. Small particles on the surface are remnants from the polishing operation.

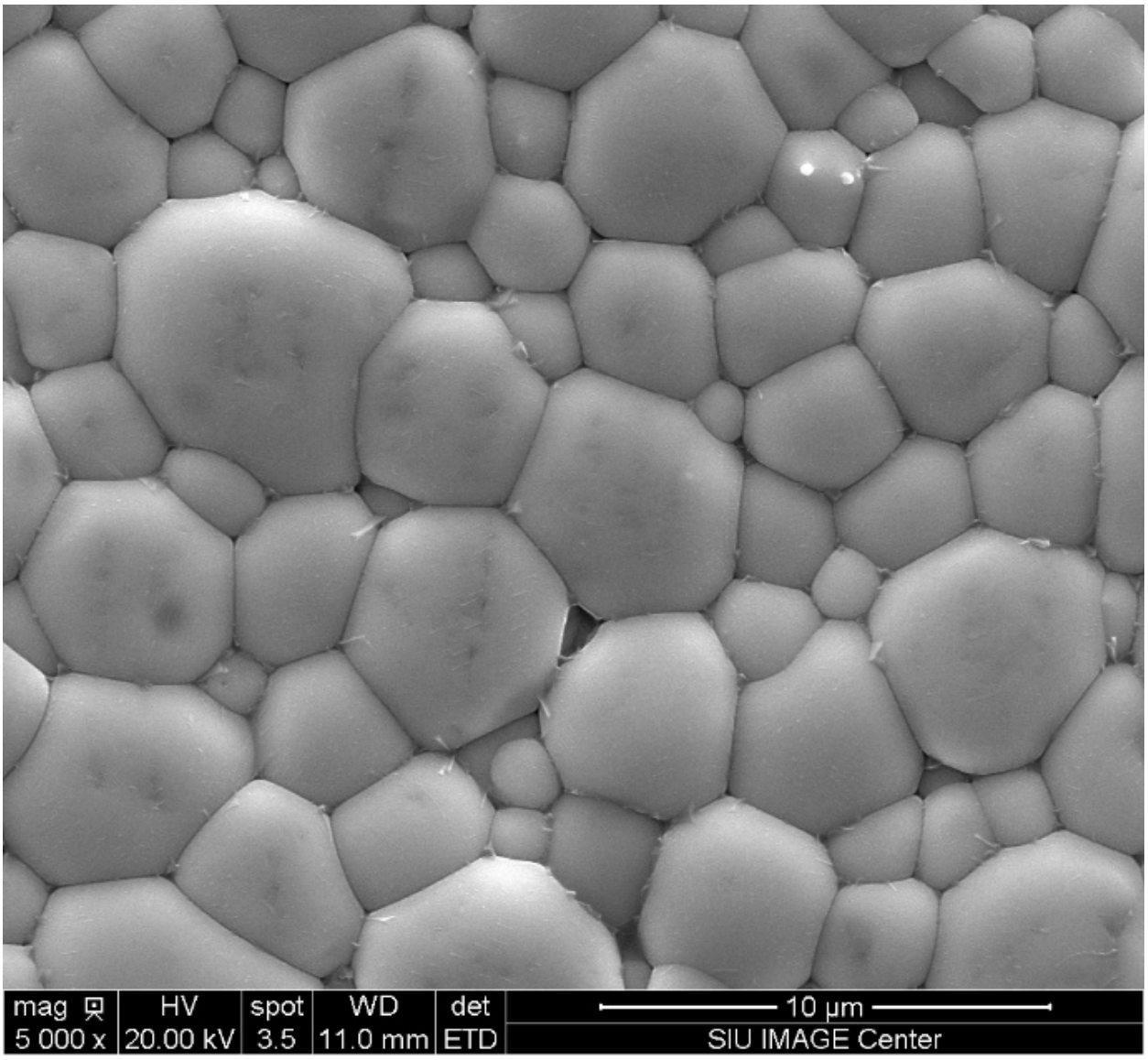


Figure S5. Microstructure for Ca-doped (x = 0.3) $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ sintered at 1400°C for 2 h in air. Small particles on the surface are remnants from the polishing operation.

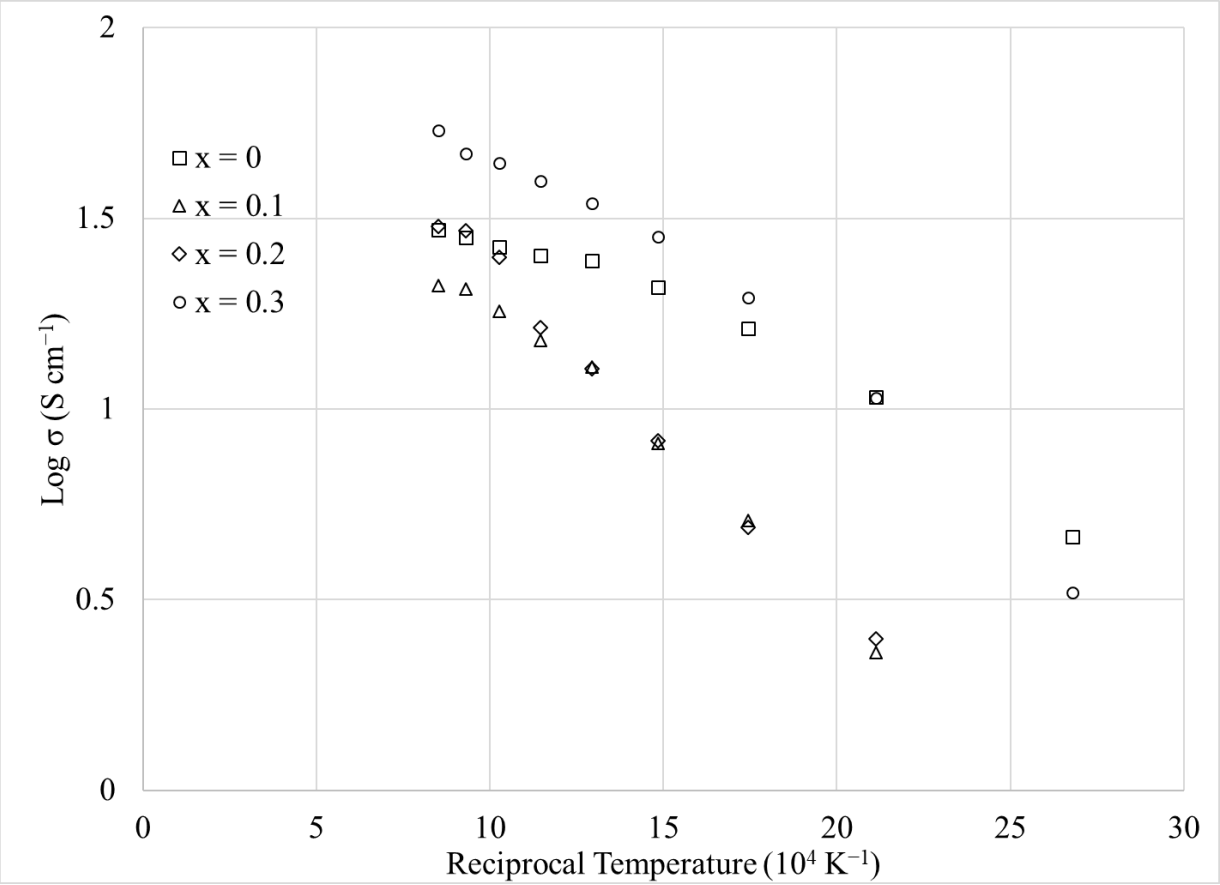


Figure S6. Semi-log plot of electrical conductivity, σ, versus reciprocal temperature (10000 K^{-1}) for $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ materials sintered at 1400°C for 2 h in air.

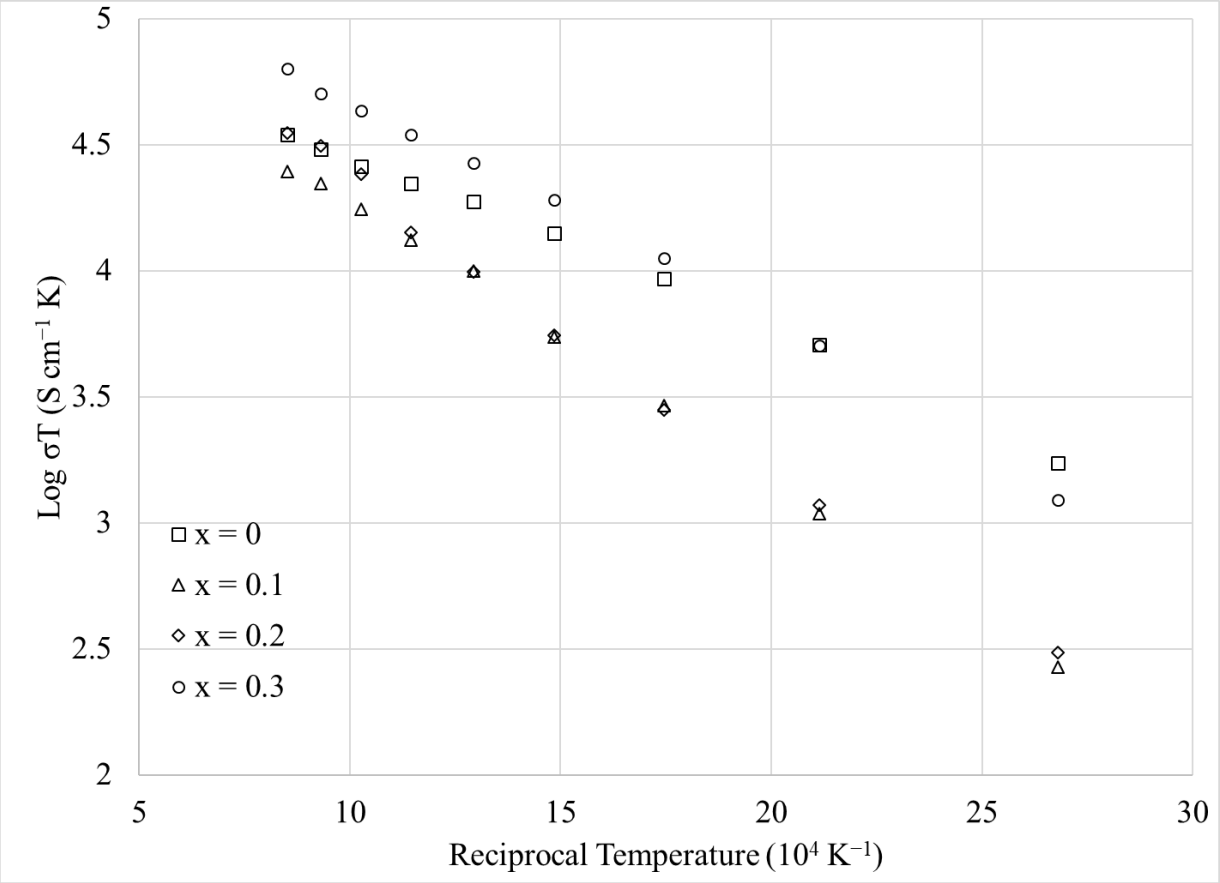


Figure S7. Arrhenius plots of σT versus reciprocal temperature (10000 K^{-1}) for $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ materials sintered at 1400°C for 2 h in air.

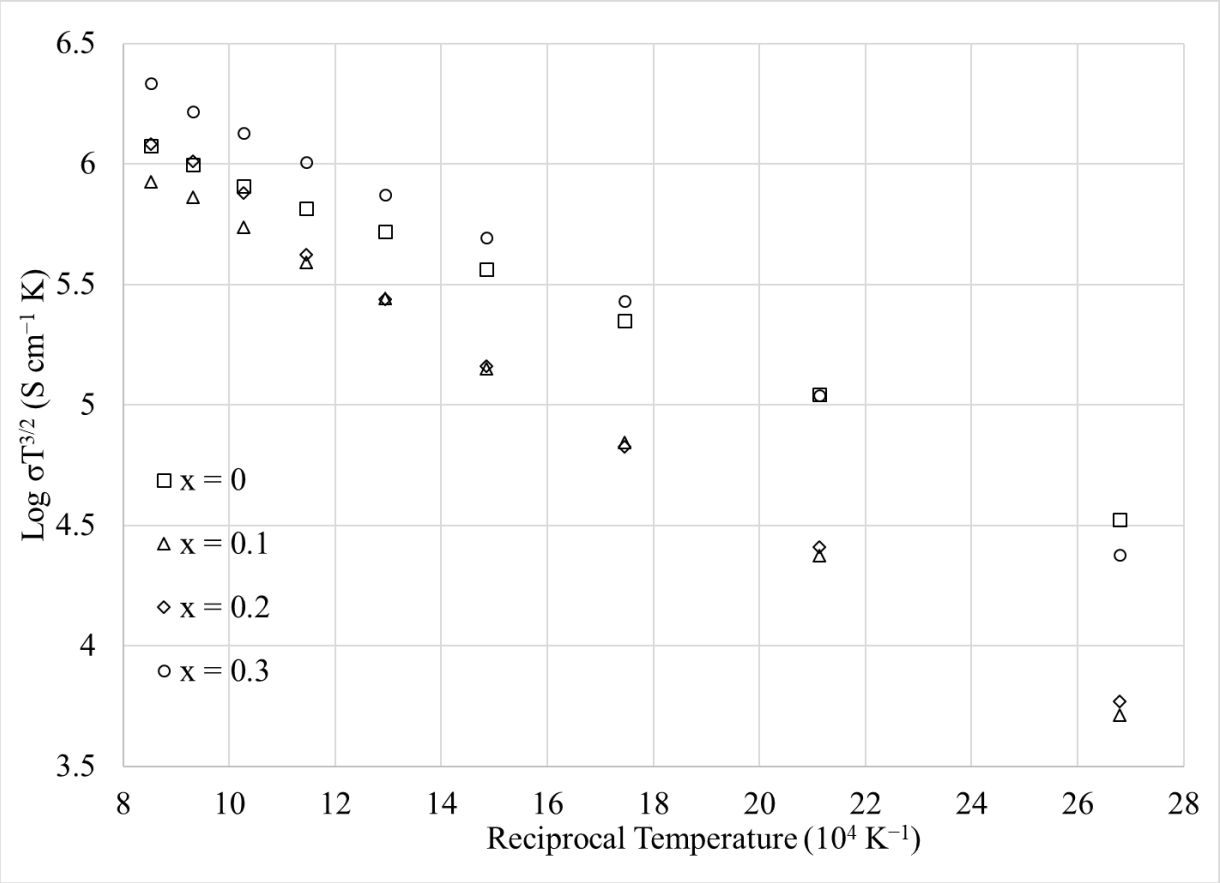


Figure S8. Arrhenius plots of $\sigma T^{3/2}$ versus reciprocal temperature (10000 K^{-1}) for $La_{1-x}Ca_x(Co_{0.25}Cr_{0.25}Fe_{0.25}Ni_{0.25})O_3$ materials sintered at 1400°C for 2 h in air.