Sol-gel assisted synthesis and characterization of Sr₂FeCrO_{6-v}

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Supplementary information:



Figure S1 XRD pattern series of temperature study for sol-gel route. Indexed: A=SrCO₃; B=SrCrO₄; C=Sr₂Fe₂O₅; D=possibly FeO; E=Sr₂Fe_xCr_{2-x}O_{6-y}; unidentified peaks are marked with *.



Figure S2 XRD pattern series of temperature study for solid-state route. Indexed: A=SrCO₃; B=Cr₂O₃; C=Fe₂O₃; D=SrCrO₄; E=Sr₂Fe_xCr_{2-x}O_{6-y}



Figure S3 Dwell time study of sol-gel assisted calcination. Indexed: A=Cubic Sr₂Fe_xCr_{2-x}O_{6-y}; B=SrCrO₄.



Figure S4 Dwell time study of solid-state calcination. Indexed: A=Cubic Sr₂Fe_xCr_{2-x}O_{6-y}; B=SrCrO₄; C=15-R Sr₂Fe_xCr_{2-x}O_{6-y}.



Figure S5 SEM/EDX image of Sol-Air sample



Figure S6 SEM/EDX image of Sol-Argon sample



Figure S7 XRD patterns of samples: a) SS-Air, indexed. A=SrCrO₄; B=Sr₂Fe_{1.6}Cr_{0.4}O₅; C=Sr₂FeCrO_{5.6} (15-R). b) SS-Ar, indexed. A=SrCrO₄; B=Sr₂Fe_{1.6}Cr_{0.4}O₅; C=Sr₂FeCrO_{5.6} (15-R).



Figure S8 Multi-phase Rietveld analysis of Sol-Air. The material mainly contained 43.19% SrCrO₄, 10.13% SrCO₃, 1.26% Sr₂FeCrO_{5.6} (15-R) and 45.41% Sr₂Fe_{1.6}Cr_{0.4}O₅ (cubic). The discrepancy was Rwp=4.84%, X^2 =1.75.



Figure S9 Multi-phase Rietveld analysis of Sol-Argon. The material contains 6.4% SrCO₃, 2.73% SrCrO₄, 23.3% Sr₂FeCrO_{5.6} (15-R), 67.5% Sr₂Fe_{1.9}Cr_{0.1}O_{5.56} (reference model for cubic phase). The discrepancy was R_{wp}=4.42%, X²=1.91.



Figure S10 Multi-phase Rietveld analysis of SS-Air. The material contains 26.15% $SrCrO_4$, 4.95% $SrCO_3$, 23.12% $Sr_2Fe_{1.6}Cr_{0.4}O_5$ (cubic) and 45.77% $Sr_2FeCrO_{5.6}$ (15-R). The discrepancy was R_{wp} =4.34%, X^2 =2.06.



Figure S11 Multi-phase Rietveld analysis of SS-Argon. The material contains 15.88% SrCrO₄, 2.44% SrCO₃, 2% Sr₂Fe_{1.93}Cr_{0.07}O₅ (orthorhombic), 16.1% Sr₂Fe_{1.6}Cr_{0.4}O₅ (cubic) and 63.6% Sr₂FeCrO_{5.6} (15-R). The discrepancy was R_{wp} =6.36%, X²=1.35.



Figure S12 SEM and TEM images of samples calcined via sol-gel route: a) SEM image of Sol-Air; b) SEM image of Sol-Argon; c) TEM image of Sol-Argon; d) Electron diffraction pattern of particle in c), indexed as a 15-R phase; e) TEM image of Sol-Air; f) TEM image of Sol-Argon; g) TEM image of material from sol-gel sample when completely dried at 80 °C, showing an organic cocooning structure;
h) TEM image of particle from sol-gel sample calcined to 500 °C.