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Effect of cation ratio and order on magnetic circular dichroism in the double perovskite $\text{Sr}_2\text{Fe}_{1+x}\text{Re}_{1-x}\text{O}_6$

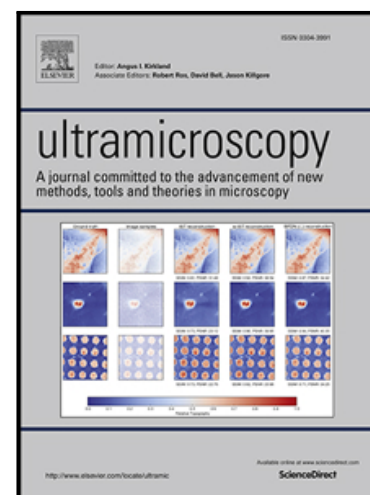
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Highlights:

- Local measurements of magnetic circular dichroism, atomic arrangement, cation order, chemical state and elemental distribution from the very same region provide an improved understanding of structure-property relationships at the nm scale in double perovskites with different structural complexities.
- 2., Antiferromagnetic $\text{Fe}^{3+}\text{-O}^{2-}\text{-Fe}^{3+}$ superexchange interactions arising from an excess of Fe suppress the magnetic circular dichroism signal from Fe cations in ordered $\text{Sr}_2[\text{Fe}][\text{Fe}_{1/5}\text{Re}_{4/5}]\text{O}_6$, when compared with ordered $\text{Sr}_2[\text{Fe}][\text{Re}]\text{O}_6$.
- Dominant $\text{Fe}^{3+}\text{-O}^{2-}\text{-Fe}^{3+}$ antiferromagnetic coupling in disordered $\text{Sr}[\text{Fe}_{4/5}\text{Re}_{1/5}]\text{O}_3$ leads to a decrease in magnetic circular dichroism signal down to the noise level.

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