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Supporting information for article:

Crystal chemistry and the role of ionic radius in rare earth tetrasilicates: $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{12}\text{F}_2$ (RE = Er^{3+} – Lu^{3+}) and $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{13}$ (RE = La^{3+} – Ho^{3+})

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Figures S1-S3: Elemental analyses obtained by EDX of representative examples of the three rare earth tetrasilicate structure types in the present study.

Figures S4-S5: Powder X-ray diffraction analysis of the composite reaction products yielding monoclinic $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{13}$ (RE = Sm-Ho) and $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{12}\text{F}_2$ (RE = Er-Lu).

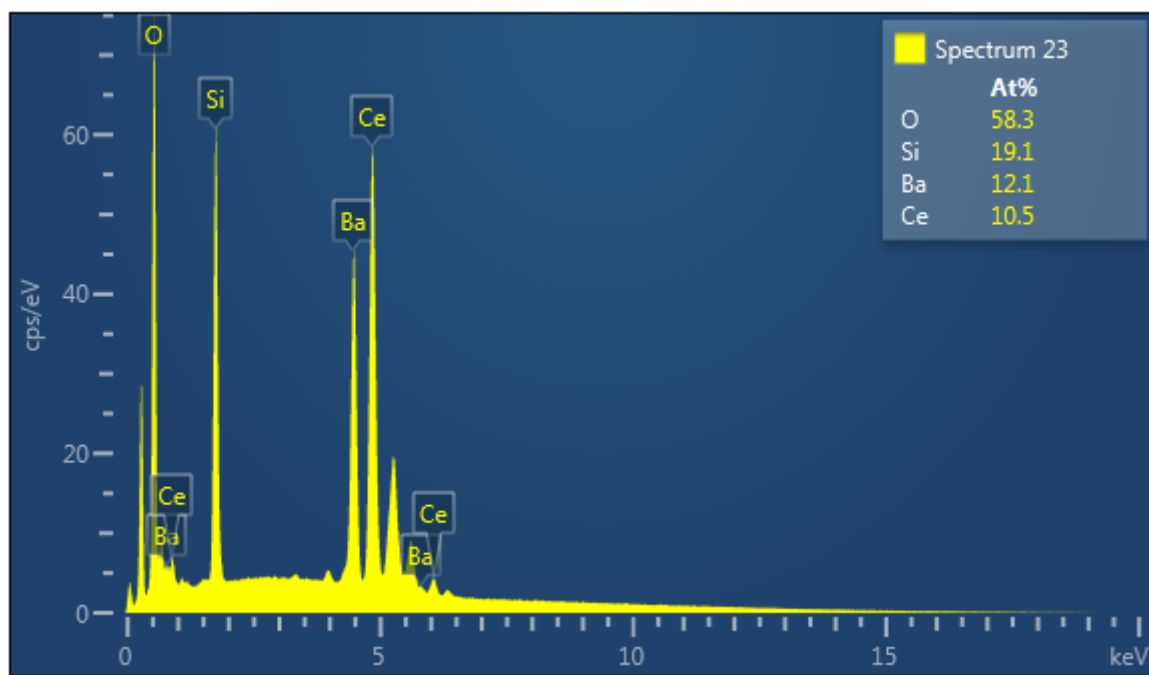
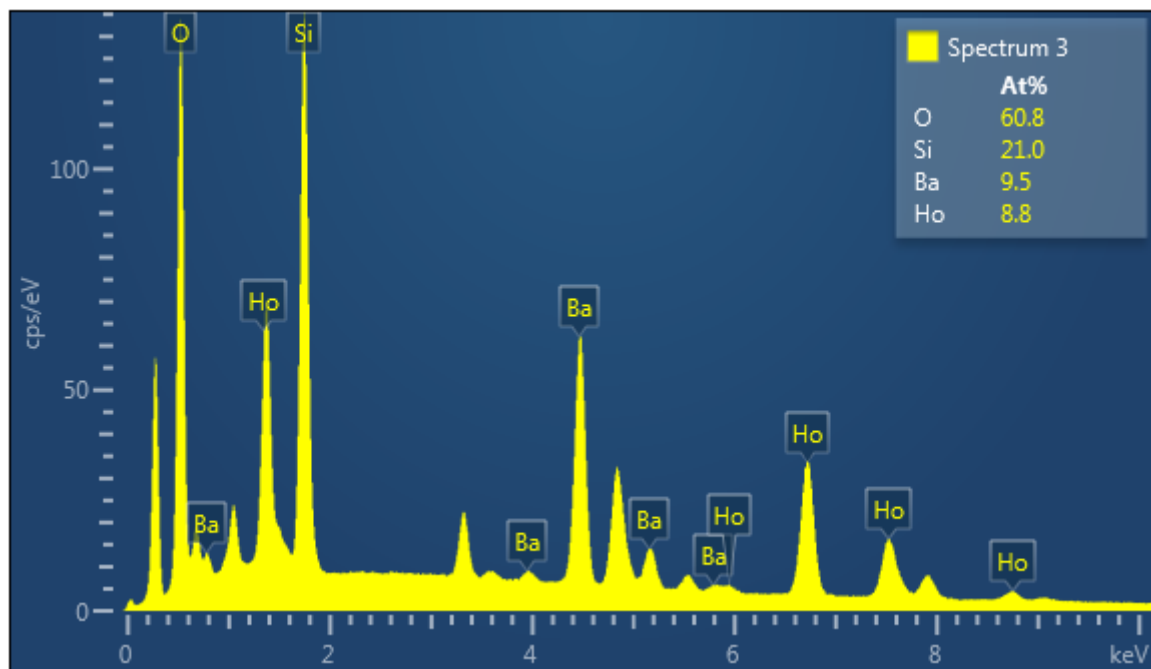
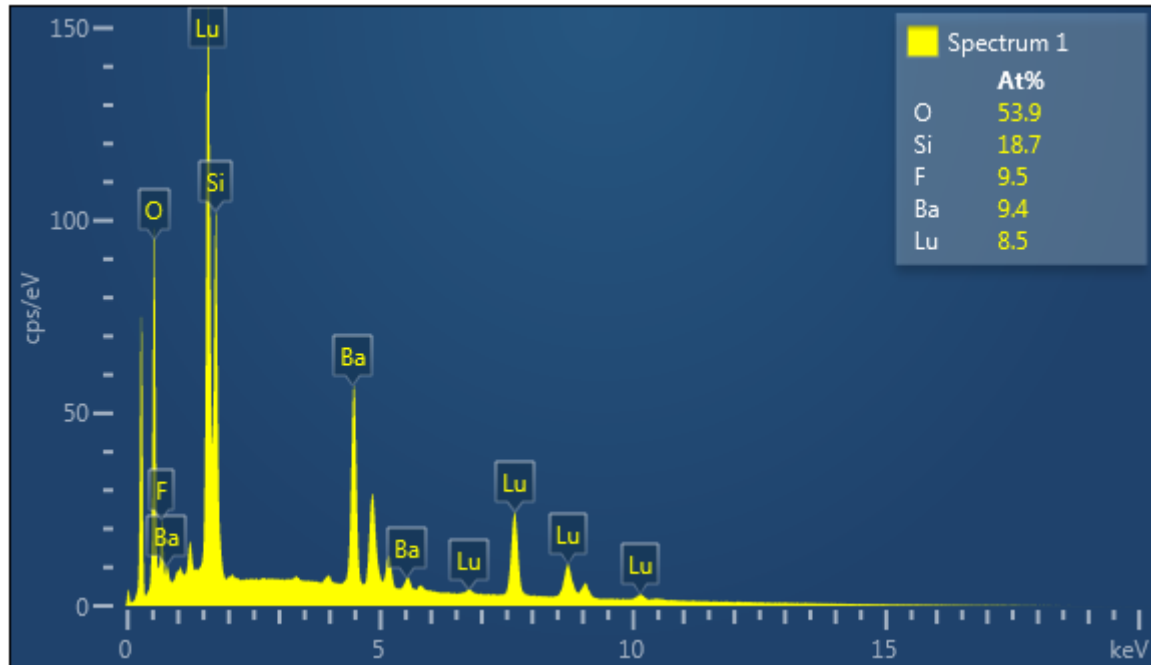


Figure S1: EDX spectrum of $\text{Ba}_2\text{Ce}_2\text{Si}_4\text{O}_{13}$.

Figure S2: EDX spectrum of $\text{Ba}_2\text{Ho}_2\text{Si}_4\text{O}_{13}$.Figure S3: EDX spectrum of $\text{Ba}_2\text{Lu}_2\text{Si}_4\text{O}_{12}\text{F}_2$.

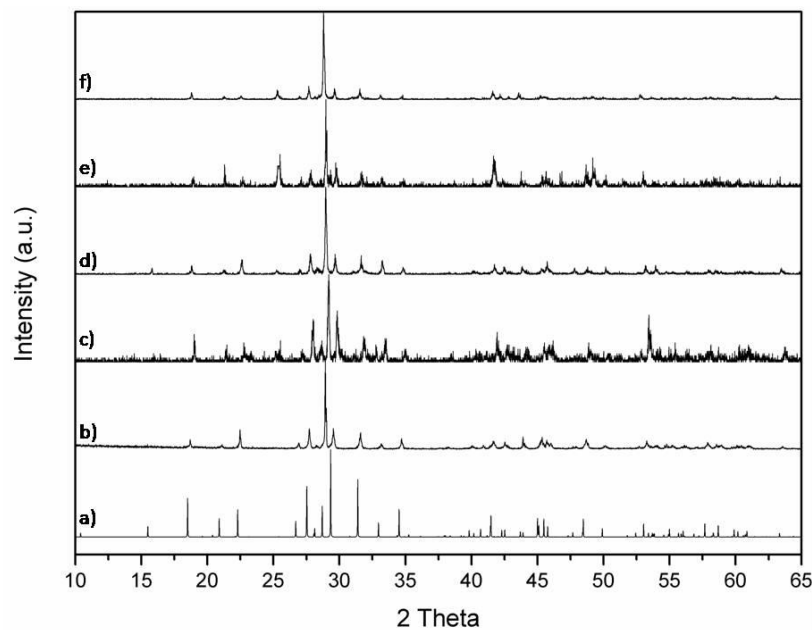


Figure S4: Powder diffraction patterns of hydrothermally grown $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{13}$ crystals: a) Simulated PXRD of $\text{Ba}_2\text{Ho}_2\text{Si}_4\text{O}_{13}$, b-f) As grown Ho, Dy, Tb, Eu, Sm analogs, respectively.

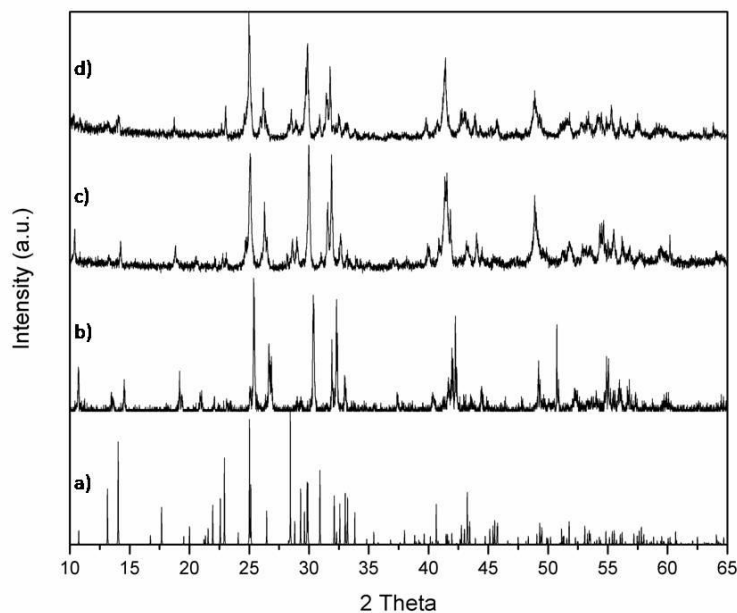


Figure S5: Powder diffraction patterns of hydrothermally grown $\text{Ba}_2\text{RE}_2\text{Si}_4\text{O}_{12}\text{F}_2$ crystals: a) Calculated diffraction pattern of $\text{Ba}_2\text{Lu}_2\text{Si}_4\text{O}_{12}\text{F}_2$ based on single crystal structure analysis, b-d) As grown Lu, Tm, and Er analogs respectively.