

Figure S1. Powder XRD pattern of crystals following PEG-assisted hydrothermal synthesis at 220 °C for 2 h a) without calcination and calcination at: b) 300 °C, c) 500 °C, d) 600 °C.

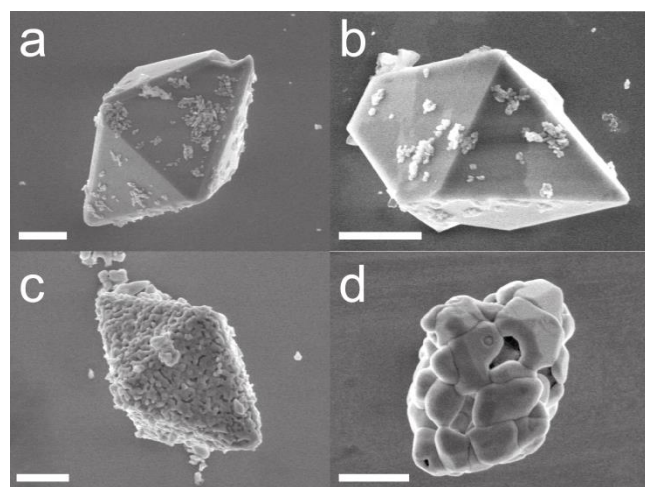


Figure S2. Scanning electron microscope images of crystals following PEG-assisted hydrothermal synthesis at 220 °C for 2 h a) without calcination and calcination at: b) 300 °C, c) 500 °C, d) 600 °C. Scale bar is 1 μm .

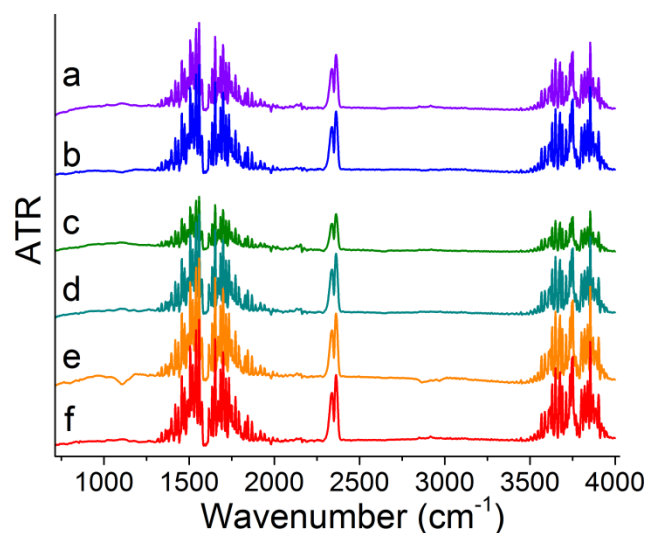


Figure S3. ATR-FTIR spectra of Yb^{3+} :LLF synthesized under following conditions: a) at 130 °C for 14 h; b) at 150 °C for 5 h; c) at 200 °C for 24 h; d) at 200 °C for 72 h; e) at 220 °C for 5 h; f) at 220 °C for 48 h.

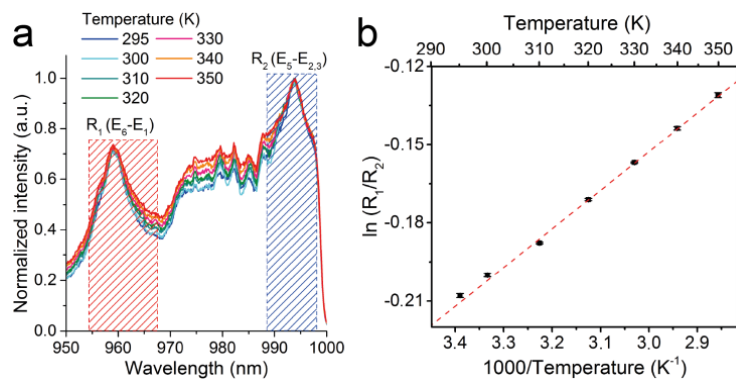


Figure S4. Temperature-calibrated PL spectra of Yb³⁺:LLF

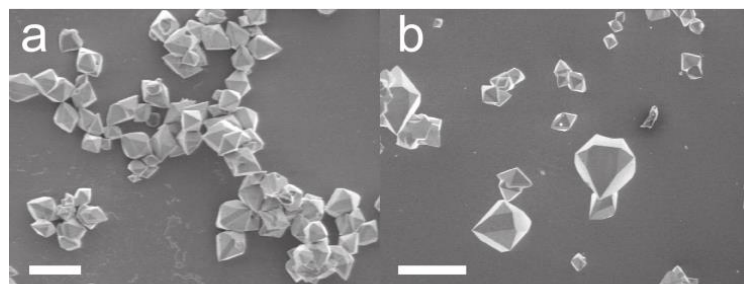


Figure S5. Scanning electron microscope images of LLF crystals following PEG-assisted hydrothermal synthesis at 200 °C for 24 h. a) RE nitrate precursor amount is 4 mmol. Scale bar is 5 μm. b) RE nitrate precursor amount is 16 mmol. Scale bar is 20 μm.

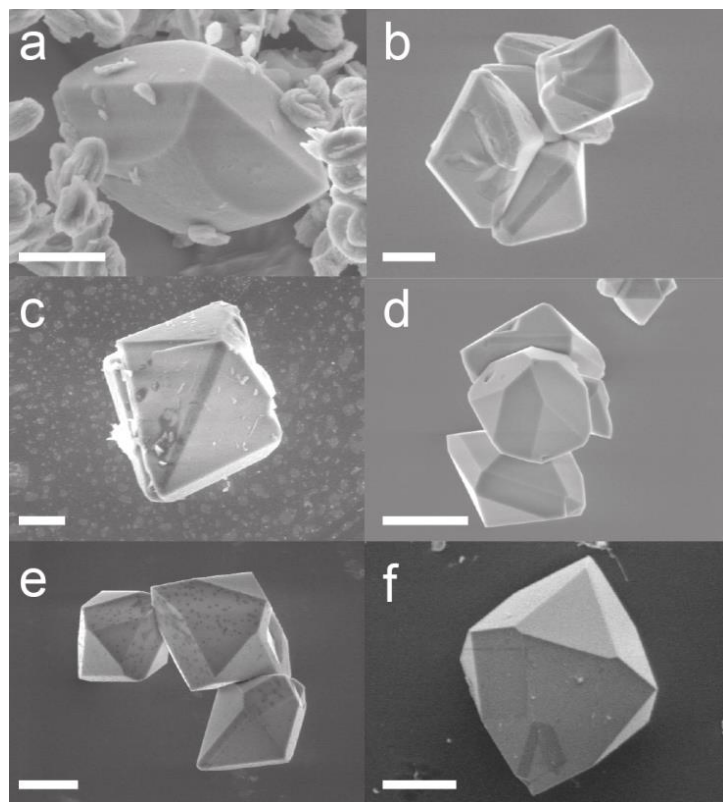


Figure S6. Scanning electron microscope images of crystals following PEG-assisted hydrothermal synthesis at: a) 100 °C (scale bar is 1 μm), b) 120 °C (scale bar is 1 μm), c) 130 °C (scale bar is 1 μm), d) 180 °C (scale bar is 2 μm), e) 200 °C (scale bar is 2 μm) and f) 220 °C (scale bar is 5 μm), for 24 h.

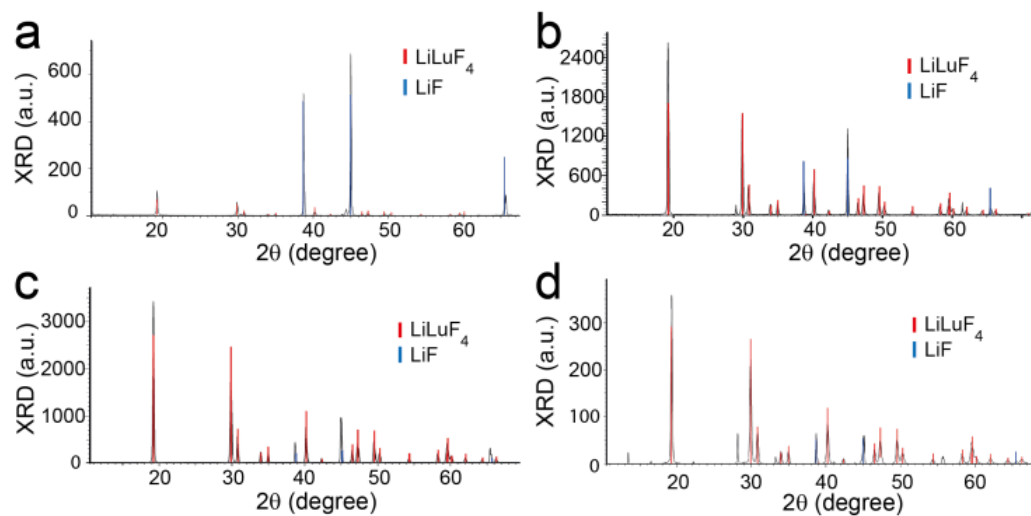


Figure S7. Powder XRD pattern of crystals following PEG-assisted hydrothermal synthesis at 130 °C for : a) 3 h, b) 5 h, c) 14 h, d) 24 h.

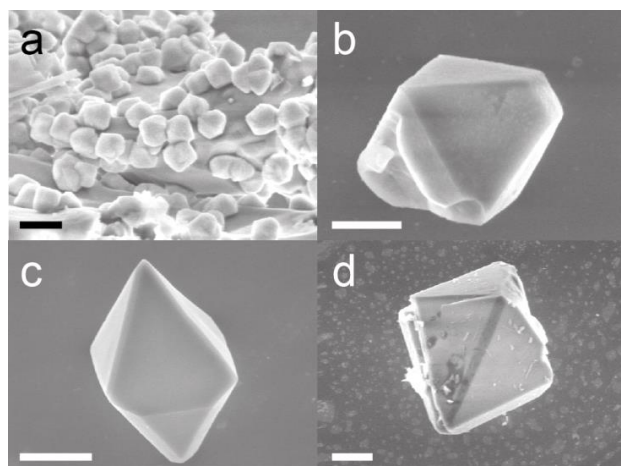


Figure S8. Scanning electron microscope images of crystals following PEG-assisted hydrothermal synthesis at 130 °C for: a) 3 h (scale bar is 1 μ m), b) 5 h (500 nm), c) 14 h (1 μ m), d) 24 h (1 μ m)