

## Synthesis of ultra-small $\text{BaLuF}_5: \text{Yb}^{3+}, \text{Er}^{3+} @ \text{BaLuF}_5: \text{Yb}^{3+}$ active-core-active-shell nanoparticles with enhanced up-conversion and down-conversion luminescence by a layer-by-layer strategy

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### Supporting information

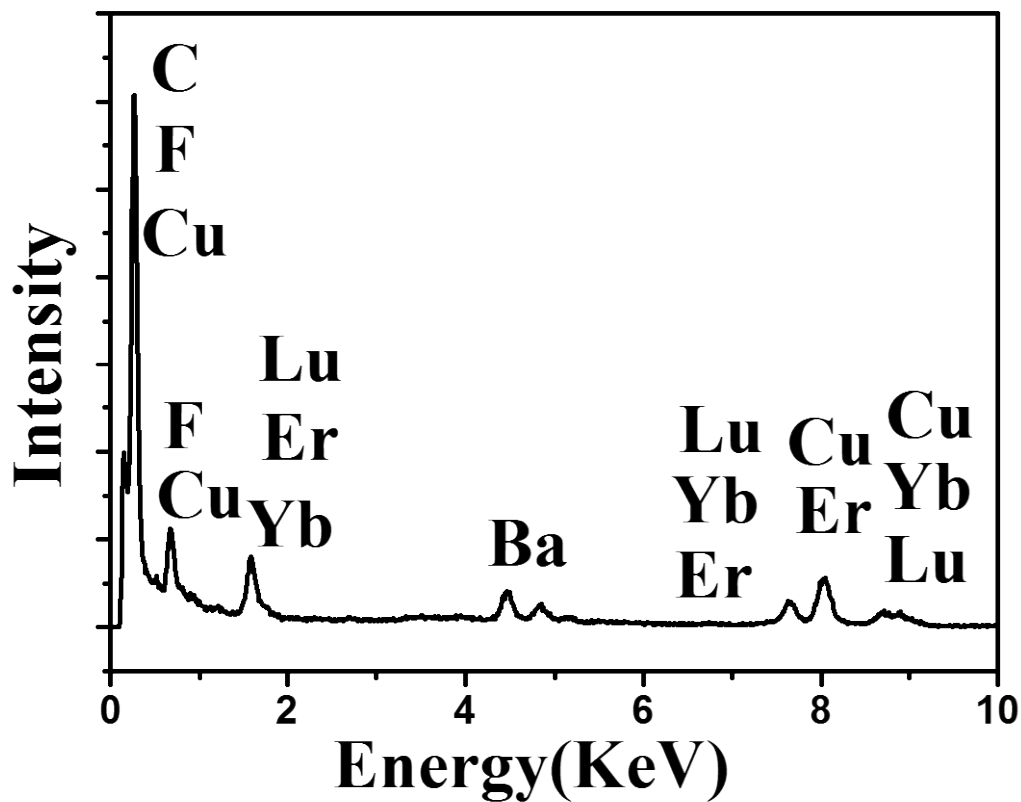


Fig. S1 The energy-dispersive X-ray spectrum of the  $\text{BaLuF}_5: 20\text{mol \%Yb}^{3+}, 2\text{mol \%Er}^{3+} @ \text{BaLuF}_5: 5\text{mol \% Yb}^{3+}$  NPs.