Supporting information

Crystal structure and up- and down-conversion properties of Yb^{3+}, Ho^{3+} codoped $BaGdF_5$ solid-solution with different morphologies

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SEM of $BaGdF_5$ samples with different hydrothermal time using PVP as dispersing agent

SEM images of the corresponding intermediates prepared at the same hydrothermal temperature (180 °C) are shown in Figure S1. It is found that when the reaction time reaches 5 h, the tiny $BaGdF_5$ octahedron nuclei form at the first stage. With the reaction time up to 10 h, the octahedron particles begin to agglomerate. After 15 h of growth, incomplete primary peanut structure appears. Then, along with the increase of reaction time up to 24 h, these formed octahedron particles served as primary nanobuilding units assemble and arrange in a three dimensional array to form eventually uniform peanut-like microcrystals. Additionally, there also exist some octahedron particles, but the dominant morphology of the products is nearly complete peanut microcrystal. Hence, we agree with the reviewer's suggestion and the corresponding discussion has been added in the supporting information of our revised manuscript.

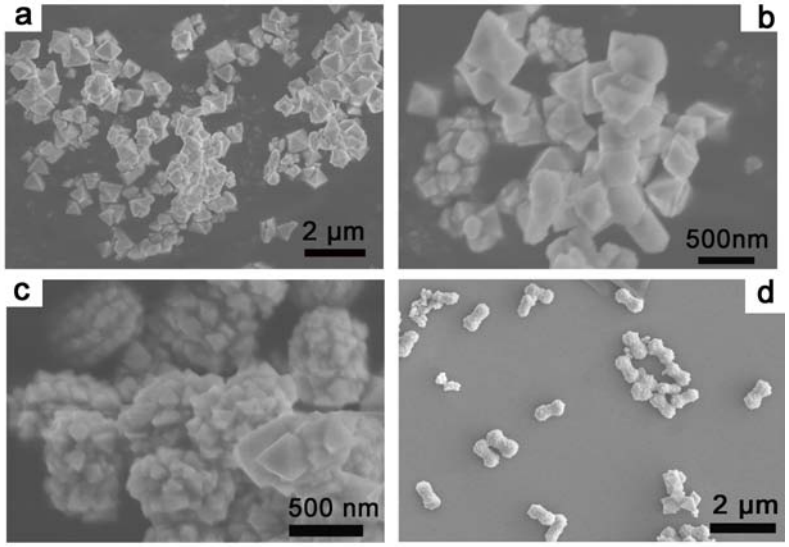

Figure S1 SEM images of a series of $BaGdF_5$ samples with different hydrothermal time: (a) 5 h, (b) 10 h, (c) 15 h and (d) 24 h