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Fast synthesis of Dy^{3+} and Tm^{3+} co-doped double perovskite $NaLaMgWO_6$: A thermally stable single-phase white-emitting phosphor for WLEDs

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Supporting Information

XRD patterns of the samples sintered at 900 ℃ for 5, 8, 10, 15, and 20 minutes are presented in Fig. S1. Almost all the peaks can be indexed by the double perovskite phase $NaLaMgWO_6$ except a small peak at 28° belonging to the impurity phase La_2O_3. Fig. S1 also shows the XRD patterns of the samples on the edge and in the middle of the crucible, which show no obvious variation. Besides, SEM images in Fig. S2 also show no obvious variation, indicating that the samples on the edge and in the middle of crucible present similar structure information. Therefore, the homogeneity of the powders synthesized in this experiment is good even the reaction time is 5 minutes.

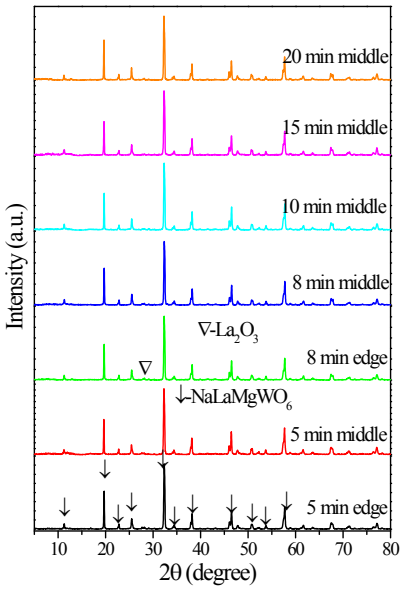

Fig. S1 XRD patterns of the samples (on the edge and in the middle of the crucible) sintered at 900 ℃ for 5, 8, 10, 15, and 20 minutes

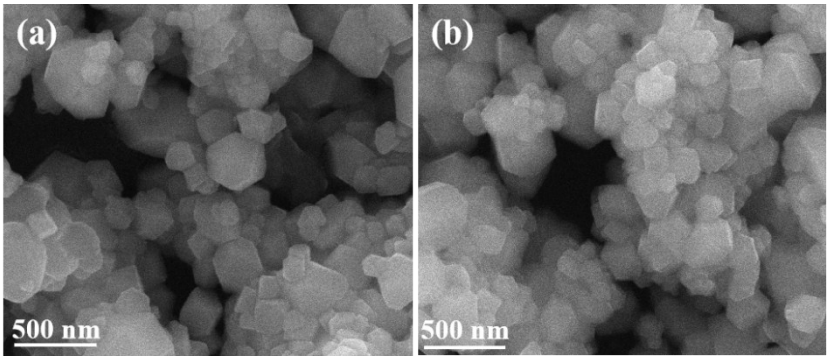

Fig. S2 SEM images (a: powders on the edge; b: powders in the middle) of $NaLa_{0.98}Dy_{0.02}MgWO_6$ sintered at 900 ℃ for 5 minutes

The refinement results of $NaLa_{0.95}Dy_{0.05}MgWO_6$ and $NaLa_{0.9}Dy_{0.1}MgWO_6$ are shown in Fig. S1. The spectrum of $NaLa_{0.95}Dy_{0.05}MgWO_6$ fit better than that of $NaLa_{0.9}Dy_{0.1}MgWO_6$, which may result from the increased impurity phase. For the undoped $NaLaMgWO_6$, it belongs to the monoclinic system P21[1]. The lattice parameters a, b, c, and β of $NaLa_{1-x}Dy_xMgWO_6$ are shown in Fig. S2.

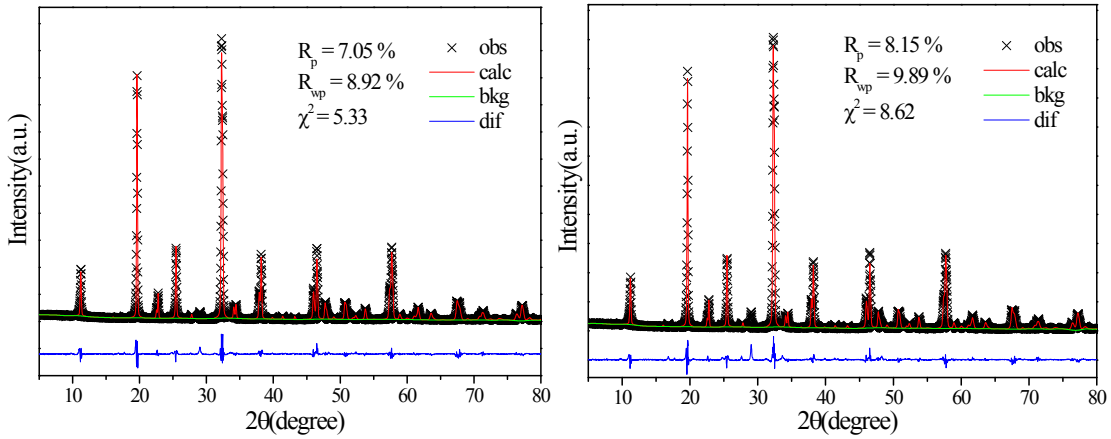

Fig. S3 Observed (×) and calculated (red line) powder XRD patterns of (a) $NaLa_{0.95}Dy_{0.05}MgWO_6$ and (b) $NaLa_{0.9}Dy_{0.1}MgWO_6$ samples

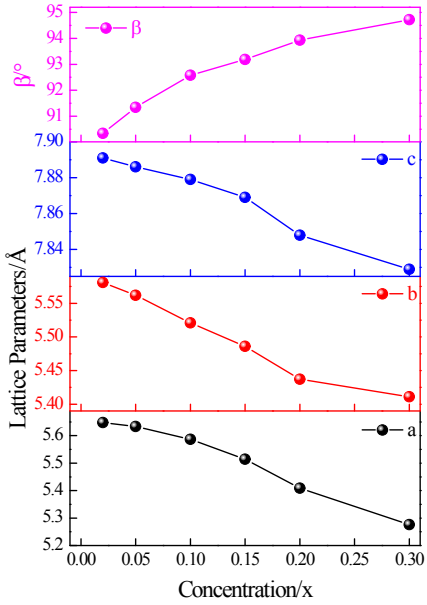

Fig. S4 Lattice parameters of $NaLa_{1-x}Dy_xMgWO_6$

Reference

[1] L. Zhang, Z. Lu, P. Han, L. Wang and Q. Zhang, *J. Mater. Chem. C*, 2013, 1, 54-57.