Electronic Supplementary Material (ESI) for Materials Advances.


# Supporting Information

## Broad-band sensitized visible up-conversion in $Y_2Mg_3Ge_3O_{12}$: $Ni^{2+}$, $Er^{3+}$, $Nb^{5+}$ phosphor

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The up-conversion (UC) emission spectra of $Ni^{2+}$ doped $YNbO_4$, $Er^{3+}$ doped $YNbO_4$ and $Ni^{2+}$, $Er^{3+}$ co-doped $YNbO_4$ samples under 1064 nm excitation.

As mentioned in the main text, $YNbO_4$ impurity exists in the prepared of $Ni^{2+}$, $Er^{3+}$ and $Ni^{5+}$ tri-doped $Y_2Mg_3Ge_3O_{12}$ sample. However, the presence of a small amount of impurity ($YNbO_4$) did not affect the UC process of the samples. As shown in Fig. S1, the $Ni^{2+}$ doped $YNbO_4$, $Er^{3+}$ doped $YNbO_4$ and $Ni^{2+}$, $Er^{3+}$ co-doped $YNbO_4$ samples prepared by us have not exhibit UC emission under 1064 nm excitation. This indicates that the broadband $Ni^{2+}$ sensitized up-conversion of $Er^{3+}$ observed in the manuscript occurs only in the $Y_2Mg_3Ge_3O_{12}$ matrix.

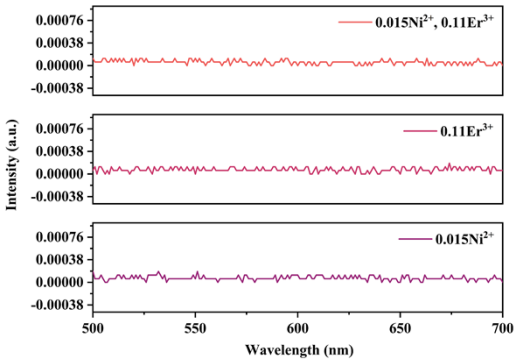


Figure S1. UC emission spectra of $Ni^{2+}$ doped $YNbO_4$, $Er^{3+}$ doped $YNbO_4$ and $Ni^{2+}$, $Er^{3+}$ co-doped $YNbO_4$ samples under 1064 nm excitation.