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Supporting Information

A novel red phosphor of $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} solid solution: facile hydrothermal controlled synthesis, microstructures and luminescent properties

Qinyu Li, Ran Luo, Li Feng, Chengli Dong, Zhanglei Ning, Mengjiao Liu, Yan Zhao, Xin Lai*, Jian Bi and Daojiang Gao*

College of Chemistry and Materials Science, Sichuan Normal University, Chengdu 610066, China
E-mail address: laixin1972@sicnu.edu.cn; laixin1972@126.com
daojianggao@sicnu.edu.cn; daojianggao@126.com

Table S1 Overview of the processing conditions for the controllable synthesis of $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} solid solution crystals.

$BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} Samples	GeO_2 (g)	TiO_2 (g)	$BaCO_3$ (g)	$KMnO_4$ (g)	HF (mL)	Theoretical doping concentration of Mn^{4+} (mol%)
x=0	0.2616	0	0. 4940	0.0790	50	20
x=0.1	0.2354	0.0200	0. 4940	0.0790	50	20
x=0.2	0.2093	0.0399	0. 4940	0.0790	50	20
x=0.3	0.1831	0.0599	0. 4940	0.0790	50	20
x=0.4	0.1569	0.0799	0. 4940	0.0790	50	20
x=0.5	0.1308	0.0998	0. 4940	0.0790	50	20
x=0.6	0.1046	0.1198	0. 4940	0.0790	50	20
x=0.7	0.0785	0.1398	0. 4940	0.0790	50	20
x=0.8	0.0523	0.1597	0. 4940	0.0790	50	20
x=0.9	0.0262	0.1797	0. 4940	0.0790	50	20
x=1.0	0	0.1997	0. 4940	0.0790	50	20

Fig. S1 Rietveld XRD refinement for $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} solid solution crystals.

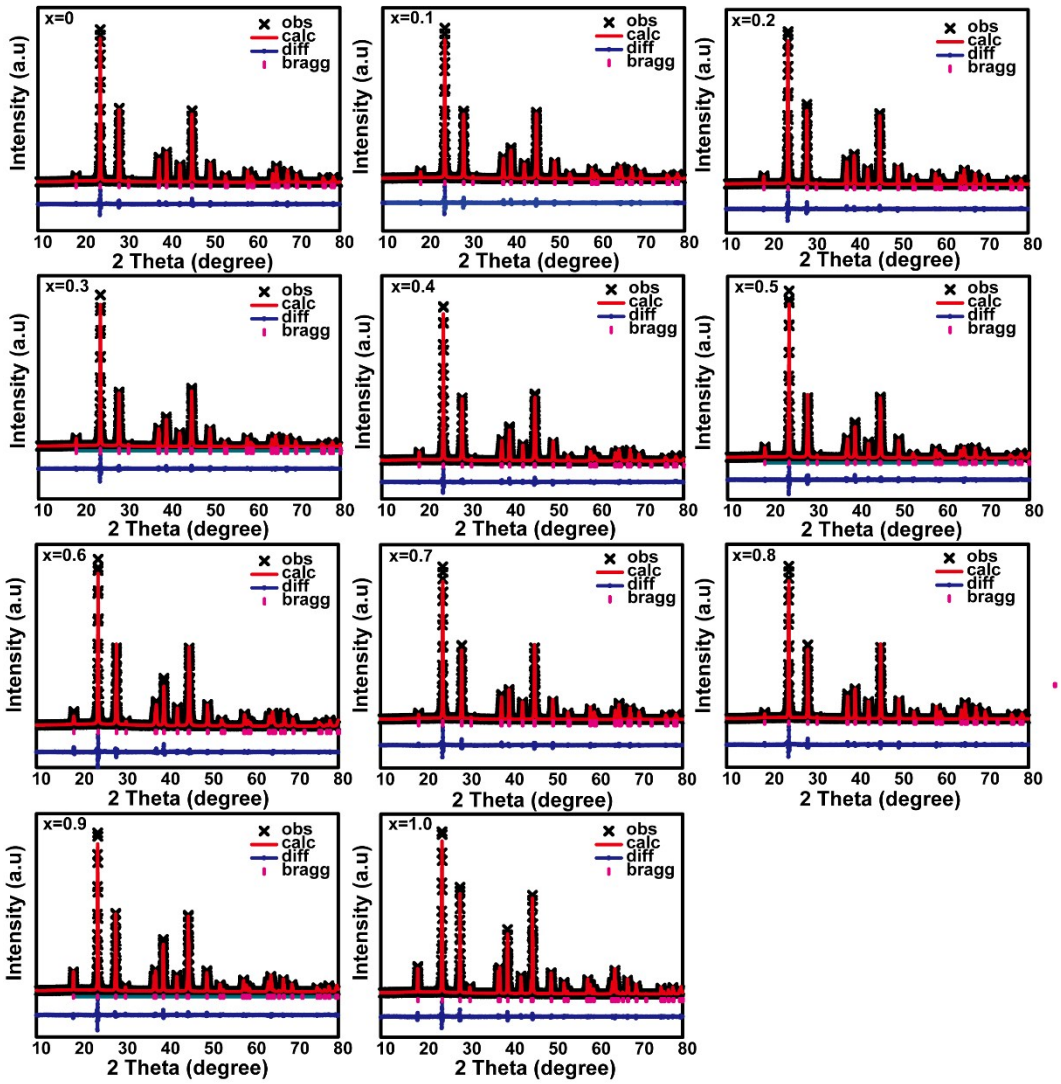

Table S2 The test conditions and calculation results of the actual doping concentration of Mn^{4+} in the synthesized $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} solid solution crystals by using an inductively coupled plasma-mass spectrometer (ICP-MS).

$BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} samples	Molar mass of $BaGe_{(1-x)}Ti_xF_6$ (g/mol)	Concentration of $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} (mol/L)	Concentration of Mn^{4+} (mol/L)	Actual doping concentration of Mn^{4+} (mol%) in solid solution crystals
x=0	323	1.857×10^{-3}	1.206×10^{-4}	6.49
x=0.1	320	1.768×10^{-3}	1.198×10^{-4}	6.77
x=0.2	318	1.880×10^{-3}	1.231×10^{-4}	6.55
x=0.3	315.5	1.832×10^{-3}	1.229×10^{-4}	6.71
x=0.4	313	1.821×10^{-3}	1.185×10^{-4}	6.51
x=0.5	310.5	1.925×10^{-3}	1.279×10^{-4}	6.64
x=0.6	308	1.903×10^{-3}	1.266×10^{-4}	6.65
x=0.7	305.5	1.767×10^{-3}	1.139×10^{-4}	6.45
x=0.8	303	1.808×10^{-3}	1.177×10^{-4}	6.50
x=0.9	300.5	1.782×10^{-3}	1.169×10^{-4}	6.56
x=1.0	298	1.818×10^{-3}	1.203×10^{-4}	6.62

Table S3 Corresponding parameters for the PL decay time of 636 nm peak in the obtained $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} phosphors (x = 0, 0.2, 0.4, 0.6, 0.8 and 1.0)

$BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} Samples	A_1	τ_1(ms)	A_2	τ_2(ms)	τ(ms)	Adj.R-Square
x=0	34943.242	4.42725	20380.5941	1.09889	4.0063	0.99986
x=0.2	9987.908	1.32446	27934.58	5.26217	4.9370	0.99983
x=0.4	8996.551	1.52703	18590.37	5.43426	4.9665	0.99974
x=0.6	16172.83	5.97581	10104.47	1.12972	5.4638	0.99964
x=0.8	29863.604	5.57837	17455.305	1.34502	5.0554	0.99982
x=1.0	16953.41	4.73472	9543.087	1.21371	4.2907	0.99978

Fig. S2 The excitation lines and emission spectra of $BaGe_{(1-x)}Ti_xF_6$: Mn^{4+} solid solution crystals measured using an integrating sphere (Internal quantum efficiency η_{QE}).