

Electronic Supplementary Information (ESI†)

Broad luminescence tuning in Mn²⁺-doped Rb₂Zn₃(P₂O₇)₂ via doping level control based on multiple synergies

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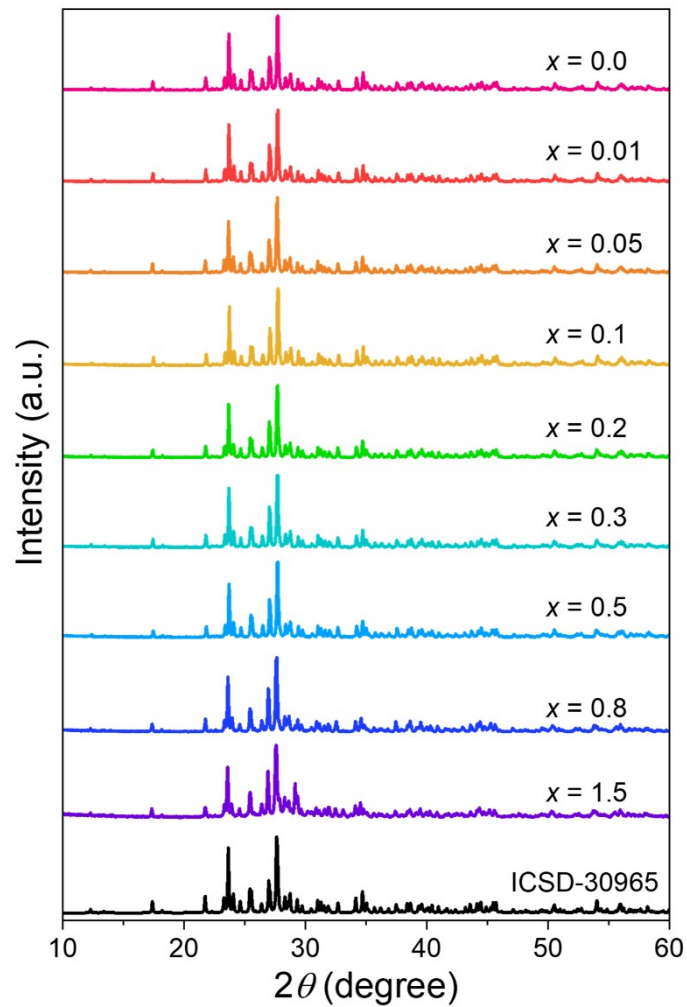


Fig S1. The XRD patterns at $2\theta = 10^\circ\text{--}60^\circ$ of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2 \cdot x\text{Mn}^{2+}$ ($x = 0, 0.01, 0.05, 0.1, 0.2, 0.3, 0.5, 0.8, 1.5$) samples.

Table S1. Fractional atomic coordinates and isotropic displacement parameters (\AA^2) of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:x\text{Mn}^{2+}$ samples.

Atom	x	y	z	B_{iso}	$Occ.$
$x = 0$					
Rb1	0.09465(19)	0.4941(8)	0.3890(4)	2.38(10)	1
Rb2	0.41730(18)	0.2505(6)	0.9489(4)	1.91(10)	1
Zn1	0.0983(2)	0	0.2082(5)	1.37(10)	1
Zn2	0.2623(2)	0.6190(7)	0.7937(5)	1.60(11)	1
Zn3	0.3871(2)	0.0888(7)	0.4533(5)	1.86(12)	1
P1	0.3856(5)	0.5142(13)	0.4332(10)	1.01(17)	1
P2	0.3126(6)	0.7899(13)	0.1598(11)	1.8(2)	1
P3	0.1832(5)	0.9839(12)	0.6394(10)	0.95(18)	1
P4	0.1034(5)	0.2809(12)	0.8851(10)	1.13(19)	1
O1	0.3642(10)	0.528(2)	0.628(2)	1.54(14)	1
O2	0.4888(11)	0.589(2)	0.418(2)	1.54(14)	1
O3	0.3705(11)	0.330(2)	0.332(2)	1.54(14)	1
O4	0.3113(11)	0.654(2)	0.325(2)	1.54(14)	1
O5	0.1975(12)	0.840(2)	0.122(2)	1.54(14)	1
O6	0.3836(11)	0.954(2)	0.210(2)	1.54(14)	1
O7	0.3493(12)	0.6800(19)	0.014(2)	1.54(14)	1
O8	0.1677(9)	0.779(3)	0.665(2)	1.54(14)	1
O9	0.1291(11)	0.075(2)	0.473(2)	1.54(14)	1
O10	0.2989(10)	0.039(2)	0.634(2)	1.54(14)	1
O11	0.1310(9)	0.072(2)	0.8199(19)	1.54(14)	1
O12	0.0193(12)	0.3510(19)	0.763(2)	1.54(14)	1
O13	0.0862(11)	0.230(2)	0.089(2)	1.54(14)	1
O14	0.2003(11)	0.400(2)	0.887(2)	1.54(14)	1
$x = 0.01$					
Rb1	0.0951(2)	0.4941(8)	0.3886(4)	1.90(11)	1
Rb2	0.4164(2)	0.2518(7)	0.9487(4)	1.66(10)	1
Zn1	0.0985(3)	0	0.2092(5)	1.43(11)	1
Zn2	0.2625(3)	0.6201(8)	0.7933(5)	1.55(13)	1
Zn3	0.3864(3)	0.0902(8)	0.4541(6)	1.32(12)	1

P1	0.3870(6)	0.5175(14)	0.4340(11)	0.58(18)	1
P2	0.3128(6)	0.7910(14)	0.1534(12)	1.9(2)	1
P3	0.1830(6)	0.9862(14)	0.6369(11)	0.92(19)	1
P4	0.1052(6)	0.2778(13)	0.8845(11)	1.2(2)	1
O1	0.3673(11)	0.527(2)	0.624(2)	1.23(15)	1
O2	0.4889(11)	0.587(2)	0.418(2)	1.23(15)	1
O3	0.3695(12)	0.333(2)	0.339(3)	1.23(15)	1
O4	0.3100(11)	0.652(2)	0.323(2)	1.23(15)	1
O5	0.2016(12)	0.843(2)	0.116(2)	1.23(15)	1
O6	0.3799(12)	0.957(2)	0.214(2)	1.23(15)	1
O7	0.3526(13)	0.674(2)	0.004(2)	1.23(15)	1
O8	0.1626(10)	0.781(3)	0.666(2)	1.23(15)	1
O9	0.1281(11)	0.071(2)	0.469(2)	1.23(15)	1
O10	0.2982(11)	0.040(2)	0.634(2)	1.23(15)	1
O11	0.1330(10)	0.077(2)	0.818(2)	1.23(15)	1
O12	0.0201(13)	0.351(2)	0.766(2)	1.23(15)	1
O13	0.0853(12)	0.228(2)	0.095(3)	1.23(15)	1
O14	0.1921(12)	0.391(2)	0.869(2)	1.23(15)	1
$x = 0.1$					
Rb1	0.0950(2)	0.4930(8)	0.3891(4)	2.33(12)	1
Rb2	0.4171(2)	0.2486(7)	0.9498(4)	1.93(11)	1
Zn1	0.0990(3)	0	0.2080(5)	1.53(12)	1
Zn2	0.2623(3)	0.6192(8)	0.7923(5)	1.87(13)	1
Zn3	0.3872(3)	0.0871(8)	0.4547(6)	1.83(13)	1
P1	0.3856(6)	0.5143(14)	0.4332(12)	1.03(19)	1
P2	0.3127(6)	0.7915(15)	0.1577(12)	2.0(2)	1
P3	0.1830(6)	0.9839(14)	0.6373(12)	1.3(2)	1
P4	0.1037(6)	0.2803(13)	0.8863(11)	1.2(2)	1
O1	0.3714(11)	0.527(3)	0.625(2)	1.84(16)	1
O2	0.4879(12)	0.578(2)	0.416(2)	1.84(16)	1
O3	0.3701(12)	0.333(2)	0.329(3)	1.84(16)	1
O4	0.3141(11)	0.648(2)	0.329(2)	1.84(16)	1
O5	0.2035(13)	0.835(2)	0.123(2)	1.84(16)	1
O6	0.3830(12)	0.947(2)	0.208(2)	1.84(16)	1

O7	0.3506(13)	0.679(2)	0.017(2)	1.84(16)	1
O8	0.1642(10)	0.778(3)	0.657(2)	1.84(16)	1
O9	0.1270(12)	0.068(2)	0.468(2)	1.84(16)	1
O10	0.2981(11)	0.037(2)	0.641(2)	1.84(16)	1
O11	0.1310(10)	0.072(2)	0.817(2)	1.84(16)	1
O12	0.0161(13)	0.355(2)	0.773(3)	1.84(16)	1
O13	0.0890(12)	0.226(3)	0.095(3)	1.84(16)	1
O14	0.1977(12)	0.388(2)	0.880(3)	1.84(16)	1

$x = 0.2$

Rb1	0.09540(19)	0.4950(8)	0.3879(4)	2.52(11)	1
Rb2	0.41678(19)	0.2519(6)	0.9486(4)	1.91(10)	1
Zn1	0.0989(2)	0	0.2061(5)	1.66(11)	1
Zn2	0.2617(3)	0.6216(7)	0.7934(5)	2.02(13)	1
Zn3	0.3879(2)	0.0905(7)	0.4548(6)	1.79(13)	1
P1	0.3859(6)	0.5156(13)	0.4351(11)	1.20(18)	1
P2	0.3128(6)	0.7909(13)	0.1596(11)	1.5(2)	1
P3	0.1828(5)	0.9874(12)	0.6368(11)	0.98(18)	1
P4	0.1033(5)	0.2821(12)	0.8862(10)	1.2(2)	1

O1	0.3662(10)	0.526(2)	0.623(2)	1.52(14)	1
O2	0.4877(11)	0.583(2)	0.413(2)	1.52(14)	1
O3	0.3679(11)	0.333(2)	0.331(2)	1.52(14)	1
O4	0.3151(11)	0.651(2)	0.325(2)	1.52(14)	1
O5	0.2023(12)	0.838(2)	0.122(2)	1.52(14)	1
O6	0.3816(11)	0.948(2)	0.217(2)	1.52(14)	1
O7	0.3504(12)	0.6838(19)	0.009(2)	1.52(14)	1
O8	0.1651(9)	0.779(3)	0.656(2)	1.52(14)	1
O9	0.1263(11)	0.072(2)	0.465(2)	1.52(14)	1
O10	0.2989(11)	0.041(2)	0.633(2)	1.52(14)	1
O11	0.1327(9)	0.068(2)	0.822(2)	1.52(14)	1
O12	0.0155(12)	0.3578(19)	0.766(2)	1.52(14)	1
O13	0.0879(11)	0.233(2)	0.088(2)	1.52(14)	1
O14	0.1978(11)	0.395(2)	0.882(2)	1.52(14)	1

$x = 0.3$

Rb1	0.0952(2)	0.4944(8)	0.3886(4)	2.97(13)	1
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Rb2	0.4167(2)	0.2506(7)	0.9486(4)	2.02(11)	1
Zn1	0.0993(3)	0	0.2063(5)	2.07(12)	1
Zn2	0.2617(3)	0.6201(8)	0.7926(5)	2.62(14)	1
Zn3	0.3870(3)	0.0885(8)	0.4549(6)	2.41(14)	1
P1	0.3852(6)	0.5147(14)	0.4351(12)	1.19(19)	1
P2	0.3139(6)	0.7915(14)	0.1607(12)	2.0(2)	1
P3	0.1829(5)	0.9865(13)	0.6354(11)	0.92(19)	1
P4	0.0999(6)	0.2825(13)	0.8813(11)	1.5(2)	1
O1	0.3707(11)	0.533(2)	0.628(2)	1.90(15)	1
O2	0.4866(12)	0.578(2)	0.415(2)	1.90(15)	1
O3	0.3711(12)	0.332(2)	0.334(3)	1.90(15)	1
O4	0.3143(11)	0.657(2)	0.323(2)	1.90(15)	1
O5	0.2038(13)	0.843(2)	0.125(2)	1.90(15)	1
O6	0.3794(12)	0.948(2)	0.220(2)	1.90(15)	1
O7	0.3484(13)	0.678(2)	0.010(2)	1.90(15)	1
O8	0.1662(10)	0.781(3)	0.659(2)	1.90(15)	1
O9	0.1251(11)	0.075(2)	0.463(2)	1.90(15)	1
O10	0.2948(11)	0.037(2)	0.628(2)	1.90(15)	1
O11	0.1331(10)	0.071(2)	0.820(2)	1.90(15)	1
O12	0.0157(13)	0.354(2)	0.769(3)	1.90(15)	1
O13	0.0913(12)	0.227(2)	0.097(3)	1.90(15)	1
O14	0.1965(11)	0.394(2)	0.878(2)	1.90(15)	1
<hr/> $x = 0.5$ <hr/>					
Rb1	0.0950(2)	0.4951(8)	0.3877(4)	2.63(12)	1
Rb2	0.4163(2)	0.2513(7)	0.9487(4)	1.77(10)	1
Zn1	0.1002(3)	0	0.2060(5)	1.84(12)	1
Zn2	0.2626(3)	0.6218(8)	0.7936(6)	2.82(14)	1
Zn3	0.3877(3)	0.0882(8)	0.4562(6)	1.95(14)	1
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P1	0.3856(6)	0.5128(14)	0.4342(11)	0.62(17)	1
P2	0.3128(6)	0.7882(14)	0.1596(11)	1.6(2)	1
P3	0.1818(6)	0.9840(14)	0.6382(12)	1.6(2)	1
P4	0.1033(6)	0.2799(13)	0.8820(11)	1.3(2)	1
O1	0.3741(11)	0.536(2)	0.628(2)	1.86(15)	1
O2	0.4874(12)	0.581(2)	0.412(2)	1.86(15)	1

O3	0.3705(12)	0.334(2)	0.326(3)	1.86(15)	1
O4	0.3149(12)	0.650(2)	0.328(2)	1.86(15)	1
O5	0.2059(13)	0.834(2)	0.118(2)	1.86(15)	1
O6	0.3824(12)	0.957(3)	0.208(2)	1.86(15)	1
O7	0.3498(13)	0.678(2)	0.004(2)	1.86(15)	1
O8	0.1608(10)	0.779(3)	0.651(2)	1.86(15)	1
O9	0.1263(11)	0.067(2)	0.460(2)	1.86(15)	1
O10	0.2954(11)	0.033(2)	0.634(2)	1.86(15)	1
O11	0.1279(10)	0.076(2)	0.814(2)	1.86(15)	1
O12	0.0228(13)	0.355(2)	0.770(3)	1.86(15)	1
O13	0.0919(12)	0.242(3)	0.087(2)	1.86(15)	1
O14	0.1962(12)	0.385(2)	0.865(2)	1.86(15)	1

Table S2. Main parameters of processing and refinement of the $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:x\text{Mn}^{2+}$ samples.

x	Space Group	Cell parameters (Å), Cell Volume (Å ³)	R_{wp} , R_{p} , R_{B} , χ^2
0	$P2_1$	$a = 13.2173(2)$, $b = 7.22254(11)$, $c = 7.19891(12)$, $\beta = 92.0270(7)$, $V = 686.796(19)$	4.98, 3.6, 1.1, 1.94
0.01	$P2_1$	$a = 13.21710(16)$, $b = 7.22270(8)$, $c = 7.19871(9)$, $\beta = 92.0363(7)$, $V = 686.777(14)$	5.34, 4.0, 1.34, 1.9
0.1	$P2_1$	$a = 13.22128(14)$, $b = 7.22530(8)$, $c = 7.20117(8)$, $\beta = 91.9919(7)$, $V = 687.495(13)$	5.53, 4.05, 1.42, 2.14
0.2	$P2_1$	$a = 13.22466(16)$, $b = 7.22804(9)$, $c = 7.20359(9)$, $\beta = 91.9457(7)$, $V = 688.183(15)$	5.19, 3.81, 1.23, 2.06
0.3	$P2_1$	$a = 13.22779(18)$, $b = 7.23029(9)$, $c = 7.20518(10)$, $\beta = 91.9146(8)$, $V = 688.724(16)$	5.32, 3.87, 1.44, 2.04
0.5	$P2_1$	$a = 13.23571(16)$, $b = 7.23557(9)$, $c = 7.20872(8)$, $\beta = 91.8553(8)$, $V = 690.002(14)$	5.16, 3.9, 1.38, 1.84

Table S3. Main bond lengths (Å) of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:x\text{Mn}^{2+}$ samples.

$x = 0$			
Rb1—O4	3.137(14)	Rb1—O8	2.996(19)
Rb1—O9	3.117(16)	Rb1—O12	3.082(15)
Rb1—O12	3.161(15)	Rb1—O13	2.881(15)
Rb2—O1	3.120(15)	Rb2—O2	3.179(15)
Rb2—O3	2.905(15)	Rb2—O6	2.894(15)
Rb2—O7	3.129(15)	Rb2—O10	3.110(14)
Rb2—O14	3.082(14)	Zn1—O5	1.870(15)
Zn1—O9	2.010(15)	Zn1—O11	2.891(14)
Zn1—O12	1.908(15)	Zn1—O13	1.874(15)
Zn2—O1	1.945(14)	Zn2—O5	3.002(15)
Zn2—O7	1.975(15)	Zn2—O8	1.917(17)
Zn2—O14	1.914(15)	Zn3—O2	1.855(14)
Zn3—O3	1.958(15)	Zn3—O6	2.003(15)
Zn3—O10	1.813(14)	P1—O1	1.444(16)
P1—O2	1.475(16)	P1—O3	1.527(17)
P1—O4	1.593(16)	P2—O4	1.543(17)
P2—O5	1.578(17)	P2—O6	1.547(17)
P2—O7	1.415(17)	P3—O8	1.506(23)
P3—O9	1.523(16)	P3—O10	1.582(14)
P3—O11	1.623(15)	P4—O11	1.625(17)
P4—O12	1.482(16)	P4—O13	1.538(16)
P4—O14	1.542(16)		
$x = 0.01$			
Rb1—O4	3.112(14)	Rb1—O8	2.992(19)
Rb1—O9	3.138(16)	Rb1—O12	3.102(15)
Rb1—O12	3.175(16)	Rb1—O13	2.856(19)
Rb2—O1	3.119(15)	Rb2—O2	3.192(15)
Rb2—O3	2.957(21)	Rb2—O6	2.912(15)

Rb2—O7	3.193(15)	Rb2—O7	3.111(17)
Rb2—O10	3.108(15)	Rb2—O14	3.164(16)
Zn1—O5	1.913(15)	Zn1—O9	1.965(15)
Zn1—O11	2.922(15)	Zn1—O12	1.915(16)
Zn1—O13	1.846(16)	Zn2—O1	1.994(15)
Zn2—O5	2.961(15)	Zn2—O7	1.934(16)
Zn2—O8	1.962(17)	Zn2—O14	1.984(16)
Zn3—O2	1.859(15)	Zn3—O3	1.949(17)
Zn3—O6	1.977(15)	Zn3—O10	1.810(15)
P1—O1	1.403(16)	P1—O2	1.446(16)
P1—O3	1.512(19)	P1—O4	1.600(17)
P2—O4	1.582(17)	P2—O5	1.532(17)
P2—O6	1.545(17)	P2—O7	1.479(17)
P3—O8	1.522(24)	P3—O9	1.517(17)
P3—O10	1.572(16)	P3—O11	1.621(16)
P4—O11	1.575(17)	P4—O12	1.485(18)
P4—O13	1.588(23)	P4—O14	1.417(17)

$x = 0.1$

Rb1—O4	3.150(14)	Rb1—O8	2.946(19)
Rb1—O9	3.149(16)	Rb1—O9	3.190(15)
Rb1—O12	3.150(21)	Rb1—O13	2.864(22)
Rb2—O1	3.128(18)	Rb2—O3	2.887(21)
Rb2—O6	2.910(15)	Rb2—O7	3.113(17)
Rb2—O10	3.085(15)	Rb2—O14	3.095(16)
Zn1—O5	1.940(16)	Zn1—O9	1.959(15)
Zn1—O11	2.909(15)	Zn1—O12	1.856(16)
Zn1—O13	1.827(22)	Zn2—O1	2.024(16)
Zn2—O5	2.972(15)	Zn2—O7	2.009(16)
Zn2—O8	1.965(17)	Zn2—O14	1.989(16)
Zn3—O2	1.869(16)	Zn3—O3	2.003(17)

Zn3—O6	2.044(15)	Zn3—O10	1.852(15)
P1—O1	1.403(17)	P1—O2	1.438(17)
P1—O3	1.520(19)	P1—O4	1.530(17)
P2—O4	1.611(17)	P2—O5	1.490(18)
P2—O6	1.495(18)	P2—O7	1.405(17)
P3—O8	1.516(24)	P3—O9	1.530(17)
P3—O10	1.569(16)	P3—O11	1.617(17)
P4—O11	1.630(17)	P4—O12	1.494(20)
P4—O13	1.572(23)	P4—O14	1.468(17)

$x = 0.2$

Rb1—O4	3.164(14)	Rb1—O8	2.945(19)
Rb1—O9	3.132(16)	Rb1—O9	3.200(14)
Rb1—O12	3.117(15)	Rb1—O12	3.185(15)
Rb1—O13	2.872(15)	Rb2—O1	3.125(15)
Rb2—O2	3.177(15)	Rb2—O3	2.910(15)
Rb2—O6	2.973(15)	Rb2—O7	3.123(16)
Rb2—O10	3.112(15)	Rb2—O14	3.097(14)
Zn1—O5	1.914(15)	Zn1—O9	1.958(15)
Zn1—O11	2.860(15)	Zn1—O12	1.846(15)
Zn1—O13	1.890(15)	Zn2—O1	2.002(14)
Zn2—O5	2.965(15)	Zn2—O7	1.966(15)
Zn2—O8	1.955(17)	Zn2—O14	1.960(15)
Zn3—O2	1.873(14)	Zn3—O3	1.980(15)

Zn3—O6	1.998(15)	Zn3—O10	1.807(15)
P1—O1	1.389(16)	P1—O2	1.446(16)
P1—O3	1.533(17)	P1—O4	1.553(17)
P2—O4	1.562(17)	P2—O5	1.516(17)
P2—O6	1.504(17)	P2—O7	1.435(17)
P3—O8	1.531(23)	P3—O9	1.550(16)
P3—O10	1.585(16)	P3—O11	1.618(16)
P4—O11	1.665(17)	P4—O12	1.526(16)

P4—O13	1.517(16)	P4—O14	1.494(16)
$x = 0.30$			
Rb1—O4	3.178(14)	Rb1—O8	2.975(19)
Rb1—O9	3.102(16)	Rb1—O9	3.191(14)
Rb1—O12	3.137(21)	Rb1—O12	3.177(17)
Rb1—O13	2.854(19)	Rb2—O1	3.128(15)
Rb2—O3	2.921(21)	Rb2—O6	2.986(15)
Rb2—O7	3.156(17)	Rb2—O10	3.174(15)
Rb2—O14	3.118(14)	Zn1—O5	1.896(16)
Zn1—O9	1.947(15)	Zn1—O11	2.880(15)
Zn1—O12	1.865(16)	Zn1—O13	1.822(16)
Zn2—O1	1.999(15)	Zn2—O5	3.007(15)
Zn2—O7	1.956(16)	Zn2—O8	1.948(17)
Zn2—O14	1.957(15)	Zn3—O2	1.891(16)
Zn3—O3	1.972(17)	Zn3—O6	1.974(15)
Zn3—O10	1.812(15)	P1—O1	1.416(17)
P1—O2	1.429(17)	P1—O3	1.517(19)
P1—O4	1.594(17)	P2—O4	1.521(17)
P2—O5	1.517(18)	P2—O6	1.479(17)
P2—O7	1.447(17)	P3—O8	1.513(23)
P3—O9	1.573(16)	P3—O10	1.527(16)
P3—O11	1.623(16)	P4—O11	1.655(17)
P4—O12	1.450(20)	P4—O13	1.613(23)
P4—O14	1.512(16)		
$x = 0.5$			
Rb1—O4	3.161(16)	Rb1—O8	2.911(19)
Rb1—O9	3.166(16)	Rb1—O12	3.115(21)
Rb1—O13	2.837(18)	Rb2—O1	3.133(15)
Rb2—O2	3.181(15)	Rb2—O3	2.869(21)
Rb2—O6	2.878(19)	Rb2—O7	3.149(17)
Rb2—O10	3.157(15)	Rb2—O14	3.110(16)

Zn1—O5	1.965(16)	Zn1—O9	1.915(15)
Zn1—O11	2.914(15)	Zn1—O12	1.949(16)
Zn1—O13	1.951(21)	Zn2—O1	2.025(15)
Zn2—O5	2.916(15)	Zn2—O7	1.920(16)
Zn2—O8	2.019(17)	Zn2—O14	2.001(16)
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Zn3—O2	1.881(16)	Zn3—O3	2.020(17)
Zn3—O6	2.025(17)	Zn3—O10	1.843(15)
P1—O1	1.420(16)	P1—O2	1.449(17)
P1—O3	1.521(19)	P1—O4	1.549(17)
P2—O4	1.572(17)	P2—O5	1.475(18)
P2—O6	1.562(22)	P2—O7	1.473(17)
P3—O8	1.512(24)	P3—O9	1.578(17)
P3—O10	1.546(16)	P3—O11	1.618(17)
P4—O11	1.592(17)	P4—O12	1.424(20)
P4—O13	1.515(17)	P4—O14	1.454(17)
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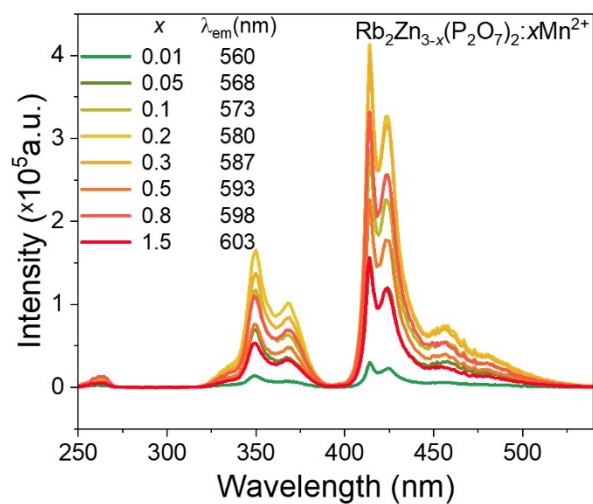


Fig S2. The PLE spectra of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:\text{xMn}^{2+}$ ($x = 0, 0.01, 0.05, 0.1, 0.2, 0.3, 0.5, 0.8, 1.5$) samples monitored at 560-603 nm.

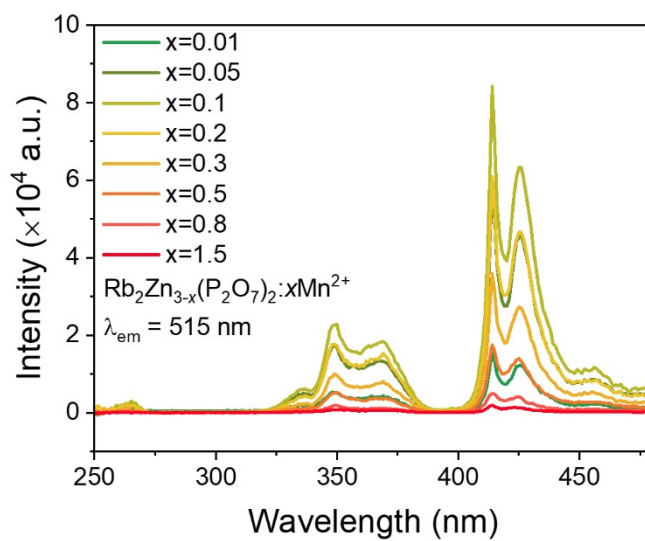


Fig S3. The PLE spectra of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:\text{xMn}^{2+}$ ($x = 0, 0.01, 0.05, 0.1, 0.2, 0.3, 0.5, 0.8, 1.5$) samples monitored at 515 nm.

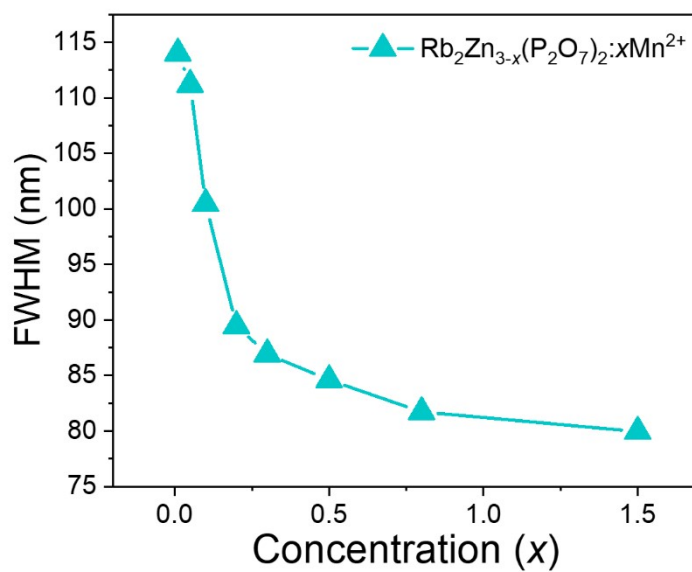


Fig S4. The full widths at half maximum (fwhms) of $\text{Rb}_2\text{Zn}_{3-x}(\text{P}_2\text{O}_7)_2:x\text{Mn}^{2+}$ ($x = 0, 0.01, 0.05, 0.1, 0.2, 0.3, 0.5, 0.8, 1.5$) samples.

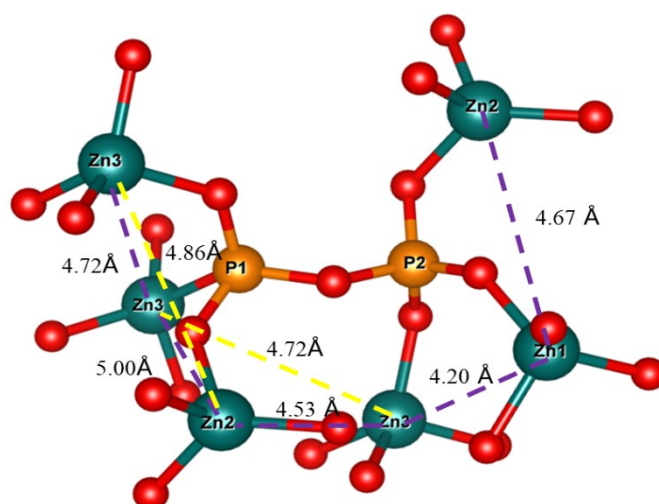


Fig S5. The local structure of $[\text{Zn}_3(\text{P}_2\text{O}_7)_2]$ framework.