Antiferromagnetic Semiconductor $Eu_3Sn_2P_4$ with Sn-Sn Dimer and Crown-wrapped Eu

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Supplemental Information

Table S1. Anisotropic thermal displacement for $Eu_3Sn_2P_4$

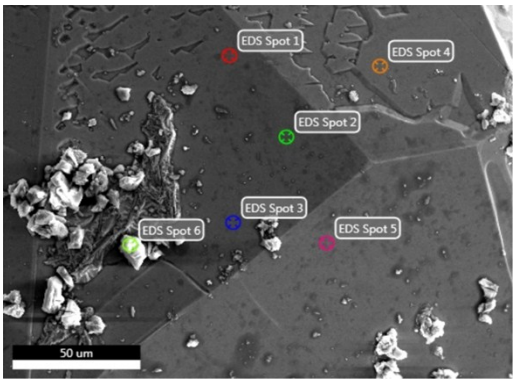
Atom	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
Eu1	0.0102(3)	0.0073(3)	0.0102(3)	-0.0006(2)	0.0000	0.0000
Eu2	0.0110(1)	0.0098(1)	0.0090(1)	0.0001(1)	-0.0001(1)	0.0005(1)
Eu3	0.0117(2)	0.0091(2)	0.0109(2)	0.0008(2)	0.0000	0.0000
Eu4	0.0120(2)	0.0104(2)	0.0111(2)	-0.0008(2)	0.0000	0.0000
Eu5	0.0111(1)	0.0097(2)	0.0098(1)	-0.0002(1)	-0.0001(1)	-0.0008(1)
Eu6	0.0191(3)	0.0119(3)	0.0156(3)	-0.0009(3)	0.0000	0.0000
Eu7	0.0138(1)	0.0099(1)	0.0127(1)	0.0003(1)	-0.0025(1)	-0.0004(1)
Sn1	0.0104(1)	0.0075(2)	0.0083(2)	-0.0003(2)	-0.0002(1)	0.0003(2)
Sn2	0.0102(2)	0.0078(2)	0.0083(2)	-0.0002(1)	-0.0003(1)	0.0002(1)
Sn3	0.0105(2)	0.0074(2)	0.0086(2)	0.0004(1)	-0.0002(2)	-0.0005(2)
P1	0.0083(1)	0.0114(1)	0.0093(1)	0.0009(8)	0.0000	0.0000
P2	0.0098(7)	0.0099(7)	0.0104(7)	-0.0005(6)	0.0004(5)	0.0019(6)
P3	0.0127(7)	0.0084(6)	0.0087(7)	0.0003(6)	0.0007(6)	-0.0013(6)
P4	0.0091(1)	0.0116(1)	0.0092(1)	-0.0025(8)	0.0000	0.0000
P5	0.0109(8)	0.0090(7)	0.0123(8)	0.0016(6)	0.0020(5)	0.0005(6)
P6	0.0105(7)	0.0101(7)	0.0105(7)	-0.0004(6)	-0.0019(6)	0.0013(6)
P7	0.0105(7)	0.0075(7)	0.0118(8)	0.0018(6)	-0.0016(6)	-0.0010(6)

Table S2 Chemical composition obtained from EDX analysis

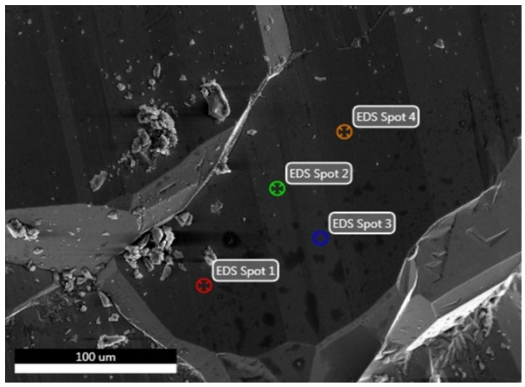
	Crystal 1 Atomic % Eu : Sn : P	**Crystal 2** Atomic % Eu : Sn : P
Spot 1	30(2):19(3):51(7)	32(2):19(3):47(7)
Spot 2	30(2):19(3):51(7)	29(2):18(3):53(7)
Spot 3	30(2):19(3):51(7)	29(2):18(3):53(7)
Spot 4	28(2):18(3):54(7)	31(2):19(3):50(7)
Spot 5	30(2):19(3):51(7)	-
Spot 6	36(2):23(3):41(7)	-

Figure S1 (a) and (b) SEM images for crystal 1 and crystal 2, respectively. (c) EDX spectrum

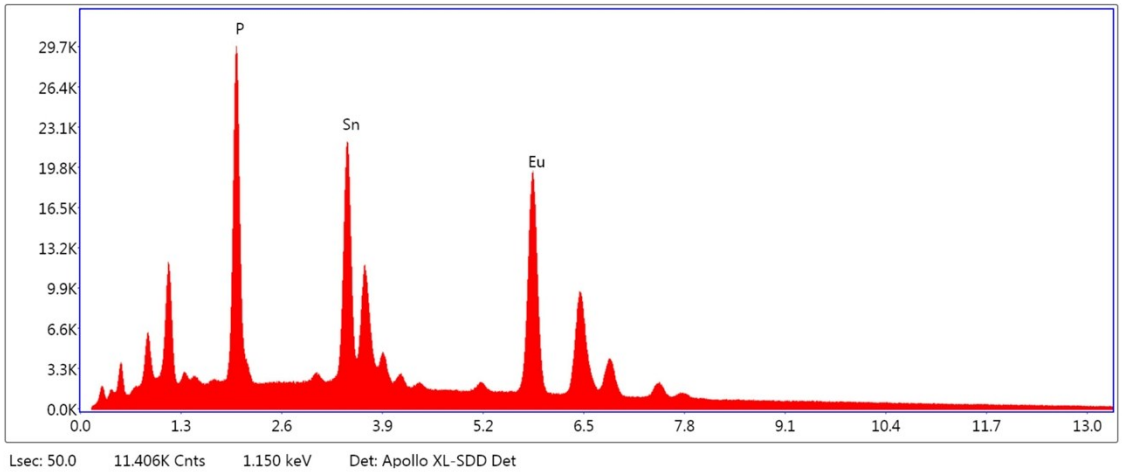
a)



b)



c)



obtained for spot 1 on crystal 1