

Supplementary information

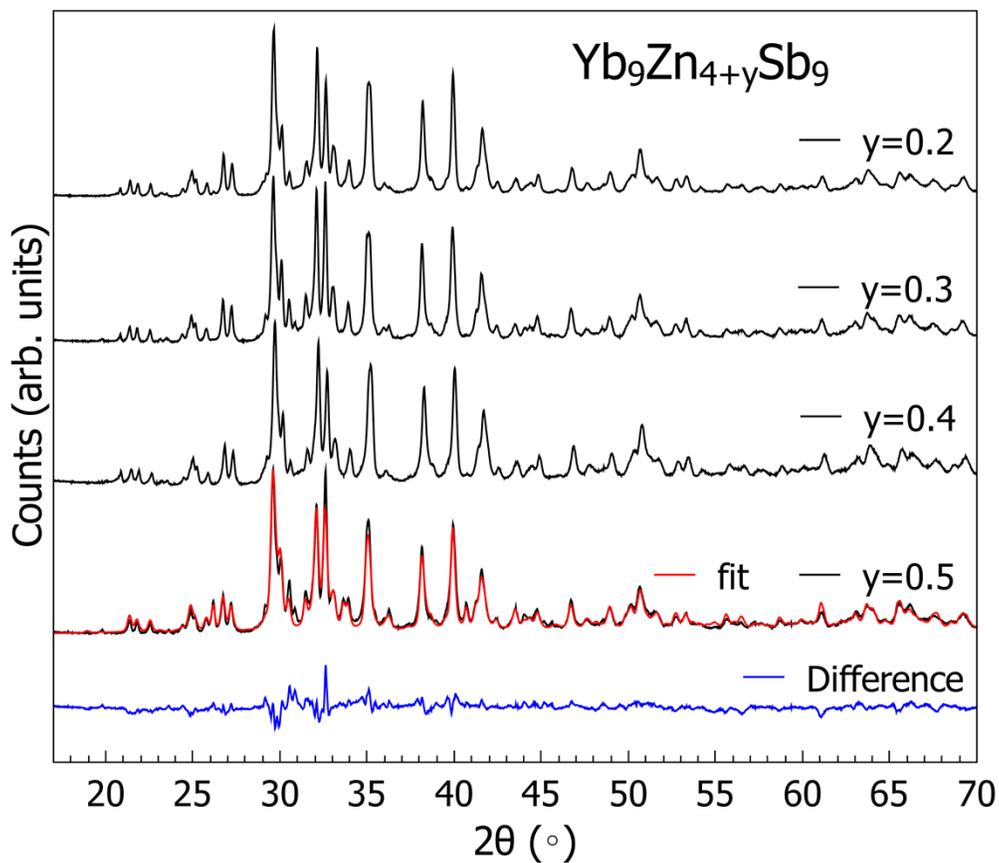


Fig.1 XRD pattern of Zn varied samples. The materials properties are not changed by changing the Zn concentration, suggesting that the amount of Zn interstitial is fixed.

Table.1 Lattice parameters for polycrystalline $\text{Yb}_9\text{Mn}_{4.2-x}\text{Zn}_x\text{Sb}_9$ and $\text{Yb}_9\text{Zn}_{4+y}\text{Sb}_9$ samples determined by Rietveld refinement.

Solid solutions	A	b	c
X=0	22.014	12.231	4.6079
X=1	21.834	12.327	4.5841
X=2	21.764	12.334	4.5664
X=3	21.711	12.343	4.5451

Zn varied	a	b	c
Y=0.2	21.691	12.409	4.5277
Y=0.3	21.703	12.406	4.5278
Y=0.4	21.665	12.395	4.5212
Y=0.5	21.692	12.411	4.5278

References	A	b	C
$\text{Yb}_9\text{Mn}_{4.18}\text{Sb}_9^1$	22.0140	12.2231	4.6081
$\text{Yb}_9\text{Mn}_{2.76}\text{Zn}_{1.616}\text{Sb}_9^1$	21.8740	12.2929	4.5796
$\text{Yb}_9\text{Mn}_{0.46}\text{Zn}_{3.88}\text{Sb}_9^1$	21.7391	12.3474	4.5384
$\text{Yb}_9\text{Zn}_{4.18}\text{Sb}_9^1$	21.6680	12.3168	4.5234
$\text{Yb}_9\text{Zn}_{4.23}\text{Sb}_9^2$	21.6770	12.3220	4.5259
$\text{Yb}_9\text{Zn}_{4.38}\text{Sb}_9^2$	21.7060	12.3381	4.5297

1. S.-Q. Xia and S. Bobev, *Chemistry of Materials*, 2009, **22**, 840-850.
2. S. Bobev, J. D. Thompson, J. L. Sarrao, M. M. Olmstead, H. Hope and S. M. Kauzlarich, *Inorganic Chemistry*, 2004, **43**, 5044-5052.