The ultra-high thermoelectric power factor in facile and scalable single-step thermal evaporation fabricated composite SnSe/Bi thin film

Manoj Kumar[1,2,3], Sanju Rani[1,2], Rahul Parmar[4], M. Amati[4], L. Gregoratti[4], Abhishek Ghosh[5], Saurabh Pathak[6], Anil Kumar[7], Xu Wang[3*], Vidya Nand Singh[1,2*]

[1]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, Uttar Pradesh- 201002, India
[2]Indian Reference Materials (BND) Division, CSIR-National Physical Laboratory, Dr. K. S. Krishnan Marg, New Delhi-110012, India
[3]School of Engineering, RMIT University, VIC 3000 Australia
[4]Elettra-Sincrotrone, Strada Statale 14, AREA Science Park 34149, Basovizza, Trieste, Italy
[5]Thin Film Laboratory, Department of Physics, Indian Institute of Technology Delhi, New Delhi 110016, India
[6]National Creative Research Initiative Center for Spin Dynamics and SW Devices, Nanospinics Laboratory, Research Institute of Advanced Materials, Department of Materials Science and Engineering, Seoul National University, Seoul 151-744, South Korea
[7]Department of Physics, M.N.S. Govt. College, Bhiwani, Haryana -127021, India

Corresponding authors: xu.wang@rmit.edu.au (X Wang), singhvn@nplindia.org (VNS),

Supplementary Information

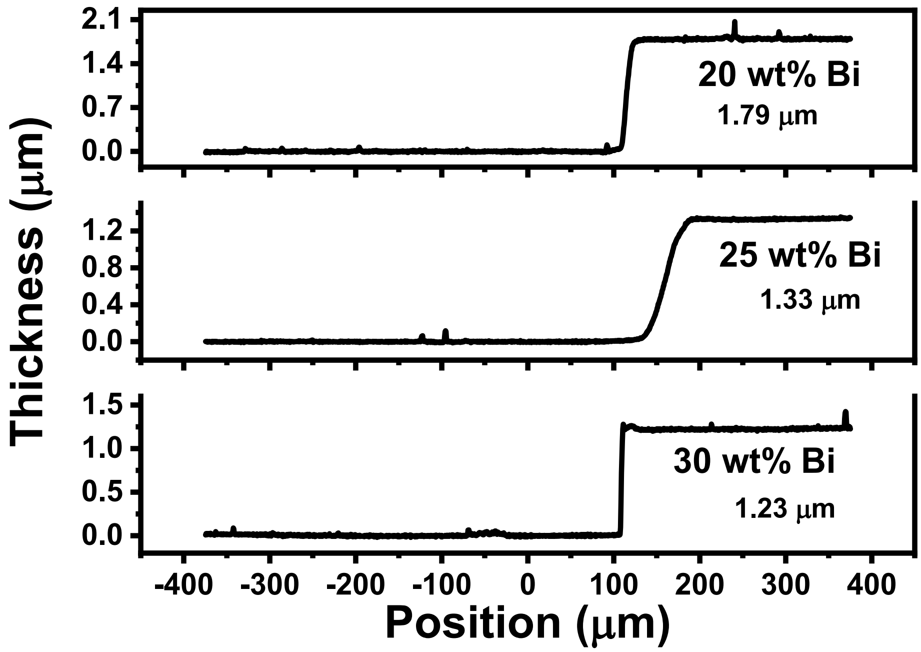


Figure S1. Thickness measurement of the SnSe/Bi composite samples

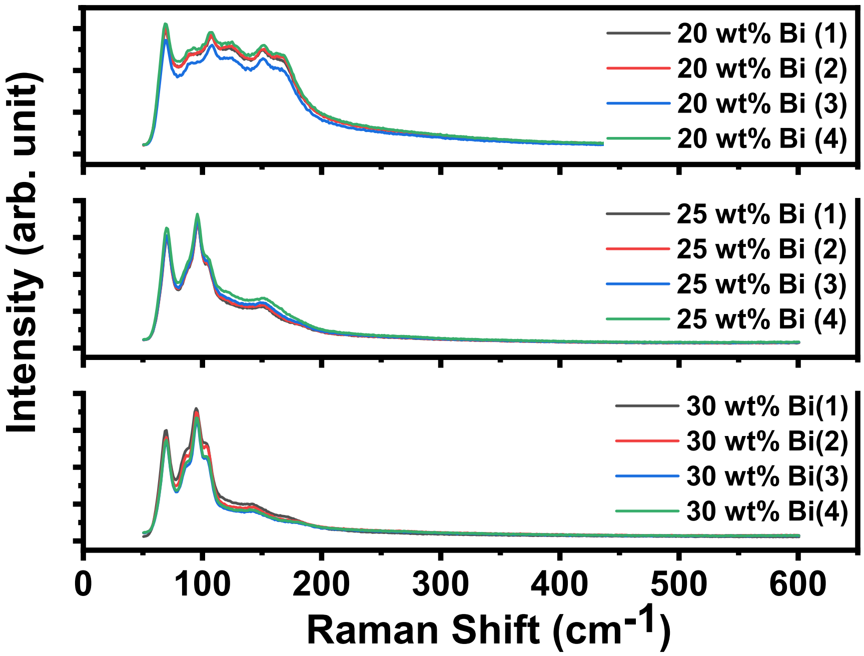
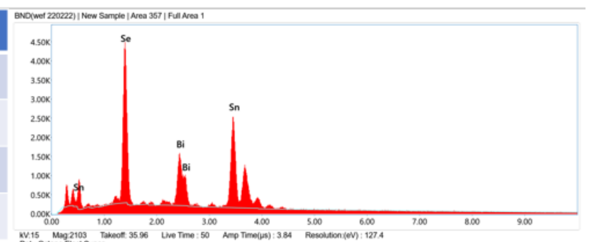
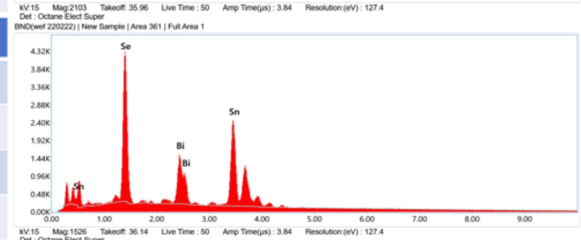


Figure S2- Raman spectra of the samples taken at 4 random points.

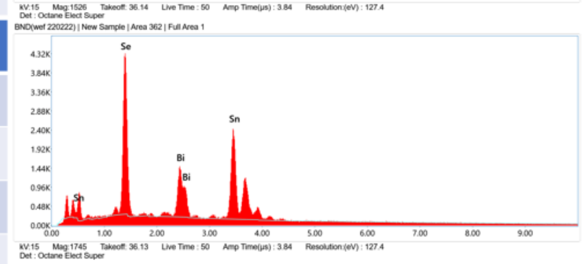
Sample S1 (1)			
Element	Weight %	MDL	Atomic %
Se L	28.99	0.65	41.53
Sn L	48.70	0.77	46.40
Bi M	22.31	0.7	12.07



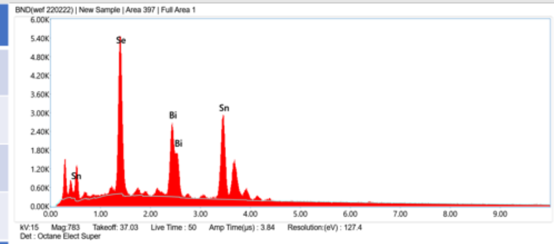
Sample S1 (2)			
Element	Weight %	MDL	Atomic %
Se L	29.17	0.66	41.66
Sn L	49.00	0.76	46.55
Bi M	21.84	0.77	11.78



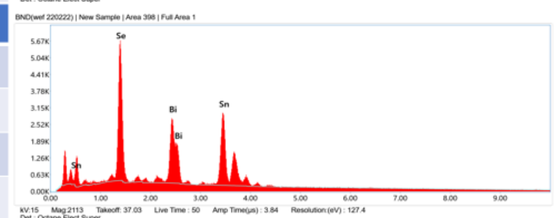
Sample S1 (3)			
Element	Weight %	MDL	Atomic %
Se L	29.64	0.67	42.20
Sn L	48.78	0.77	46.20
Bi M	21.58	0.72	11.61



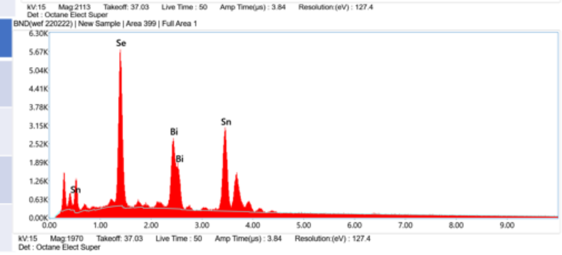
Sample S2 (1)			
Element	Weight %	MDL	Atomic %
Se L	27.07	0.54	40.33
Sn L	43.45	0.66	43.07
Bi M	29.49	0.61	16.60



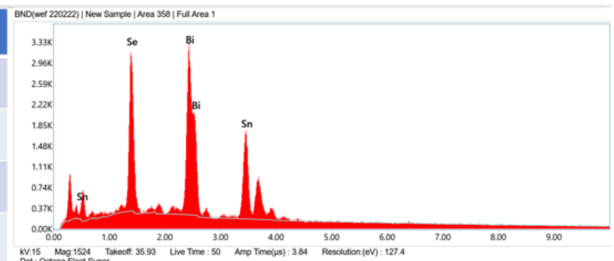
Sample S2 (2)			
Element	Weight %	MDL	Atomic %
Se L	26.78	0.54	40.08
Sn L	43.03	0.66	42.84
Bi M	30.20	0.6	17.08



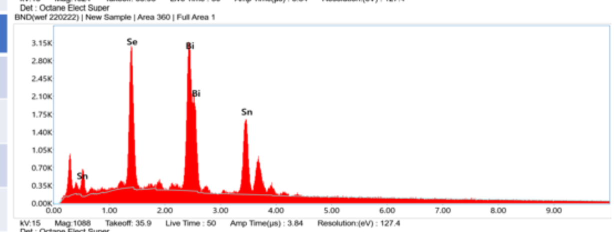
Sample S2 (3)			
Element	Weight %	MDL	Atomic %
Se L	27.16	0.55	40.42
Sn L	43.55	0.65	43.11
Bi M	29.29	0.6	16.47



Sample S3 (1)			
Element	Weight %	MDL	Atomic %
Se L	19.65	0.6	33.02
Sn L	33.12	0.81	37.01
Bi M	47.23	0.71	29.98



Sample S3 (2)			
Element	Weight %	MDL	Atomic %
Se L	19.53	0.54	32.87
Sn L	33.00	0.81	36.94
Bi M	47.47	0.7	30.18



Sample S3 (3)			
Element	Weight %	MDL	Atomic %
Se L	20.21	0.57	33.60
Sn L	34.13	0.8	37.74
Bi M	45.65	0.7	28.67

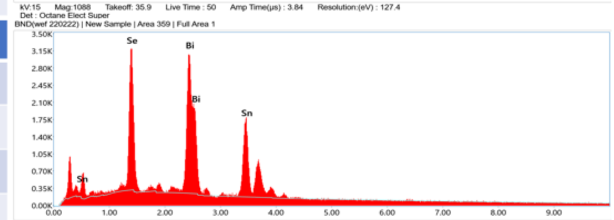


Figure S3 Top to bottom, EDX spectrum of the samples 20 wt% Bi, 25 wt% Bi and 30 wt% Bi, respectively at 3 different places on sample, respectively.

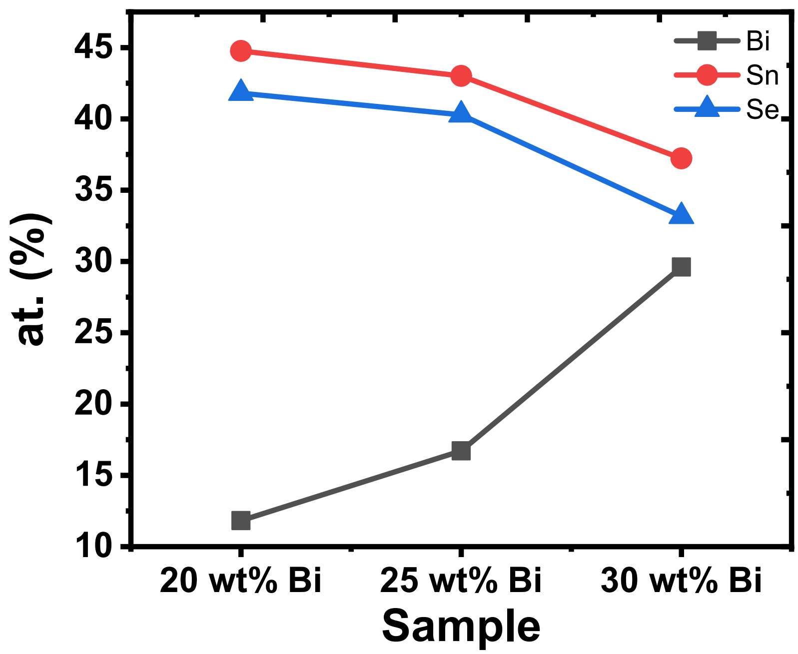


Figure S4- EDX spectra of the samples showing concentration of Sn, Se decreases and of Bi increases with increasing wt% of Bi.

Table S1 – Comparison of the SnSe thermoelectric materials

Sr. No.	Material/substrate	Growth method	Temperature (K)	Power factor (μWcm^{-1}K^{-2})	ZT	Reference
1	SnSe/fused silica	Sputtering	675	2.4		[1]
2	SnSe/sapphire	PLD	800	1.96	0.45	[2]
3	SnSe/semi-insulating silicon (111)	MPCVD	600	3.98	0.335	[3]
4	Mo-doped SnSe/Schott-D263T glass	Magnetron sputtering	576	0.44		
5	Bi-doped SnSe/STO(100)	PLD	573	0.3	0.034*	[4]

6	Bi-doped SnSe/intrinsic Si (100)	CVD	700	0.6	0.08*	[5]
7	SnSe/Si substrate having 300 nm SiO_2	PLD	478	18.5		[6]
8	SnSe ink/glass	Solution process	550	4.27		[7]
9	SnSe/SiO2/Si	PLD	573	0.15		[8]
10	SnSe/MgO	PLD	600	4.72	1.2*	[9]
11.	SnSe single crystal	vertical Bridgman crystal growth	923	~10 @ 850 K	2.62	[10]
12.	SnSe polycrystal	Solid state reaction	783	12.06 @ 473 K prep. To	3.1	[11]
13	Bi mixed $SnSe/SiO_2$ (300 nm thick)	Thermal evaporation method	580	~ 8		This work

Microwave plasma chemical vapor deposition (MPCVD)

Pulsed laser deposition PLD

SrTiO3 (STO)

Chemical vapor deposition CVD

*here ZT is calculated conservatively using literature data on thermal conductivity

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