Electronic Supplementary Material (ESI) for Materials Advances.

Supporting Information

Temperature dependence Raman and photo response study of Bi_2Te_3 thin films annealed at different temperatures for improved optoelectronic performance

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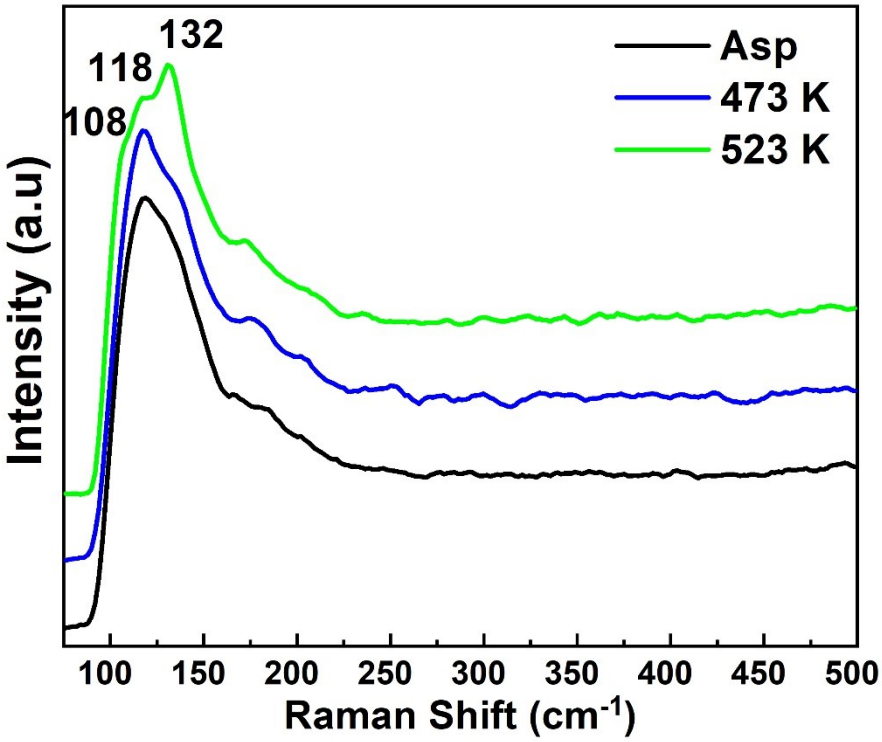

Fig. S1. Raman spectra of as-grown, 473 K and 523 K annealed thin films.

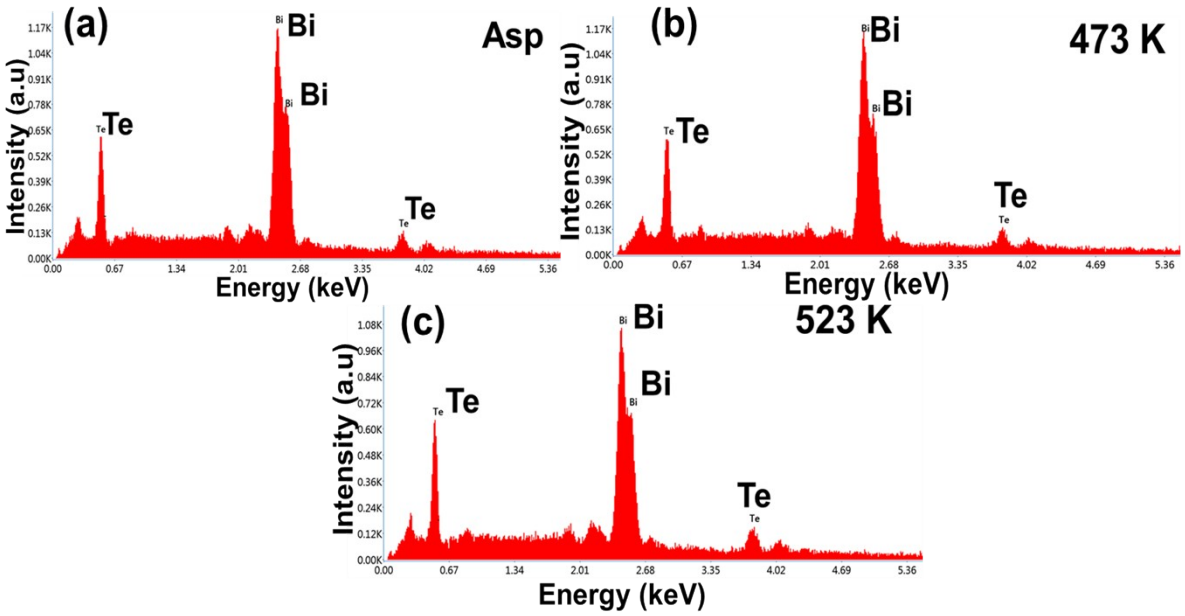

Fig.S2 EDX spectra of (a) as-grown, (b) 473 K and (c) 523 K annealed Bi_2Te_3 thin film.

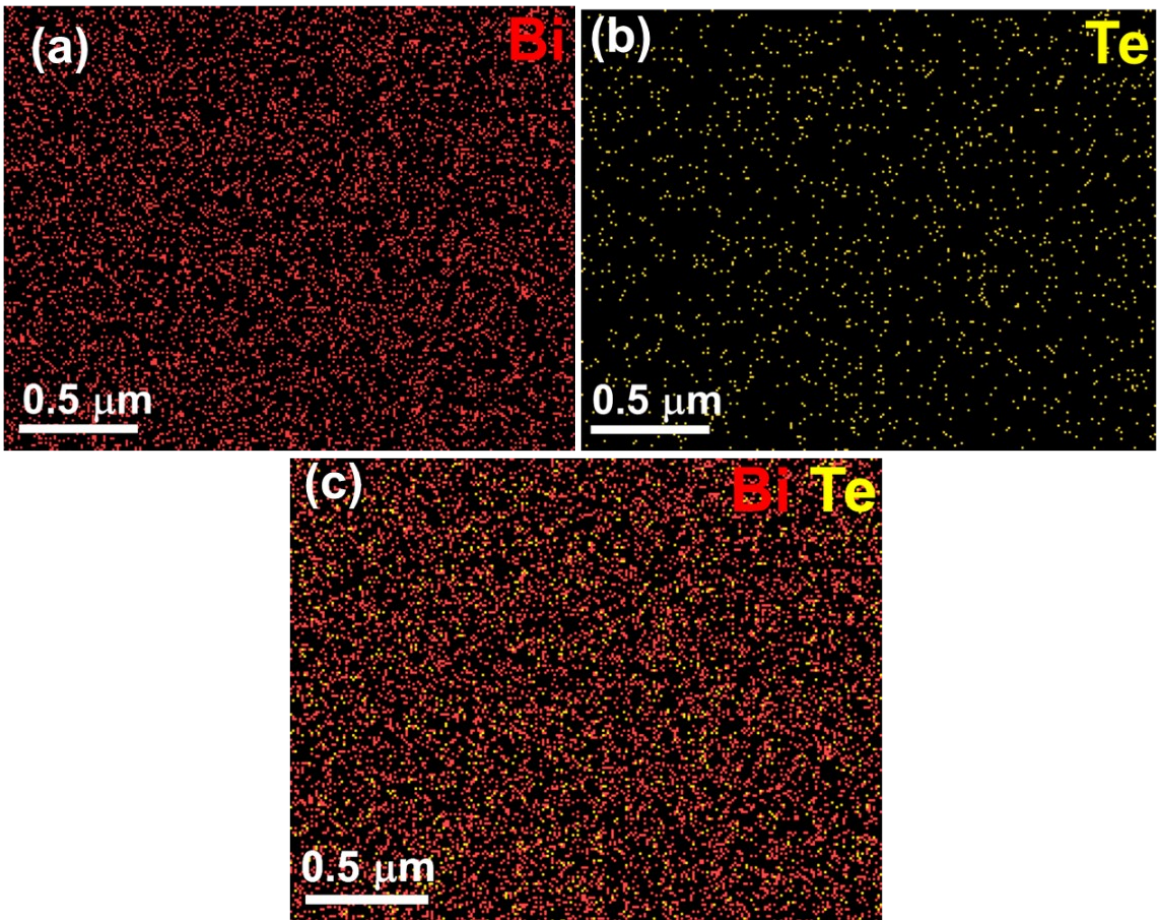

Fig. S3 Elemental mapping of (a) Bi, (b) Te and (c) overall portion of 523 K annealed Bi_2Te_3 thin film.

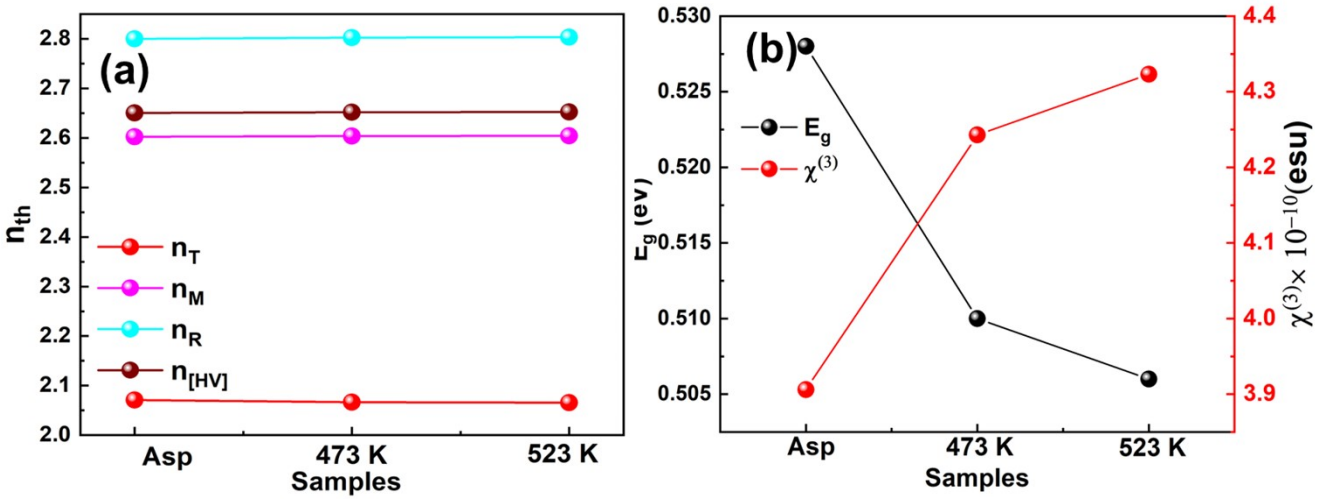

Fig. S4 (a) Variation of theoretically calculated refractive index of different samples from various models and (b) Plot between optical bndgap and third order susceptibility of as-prepared and annealed Bi_2Te_3 thin films.

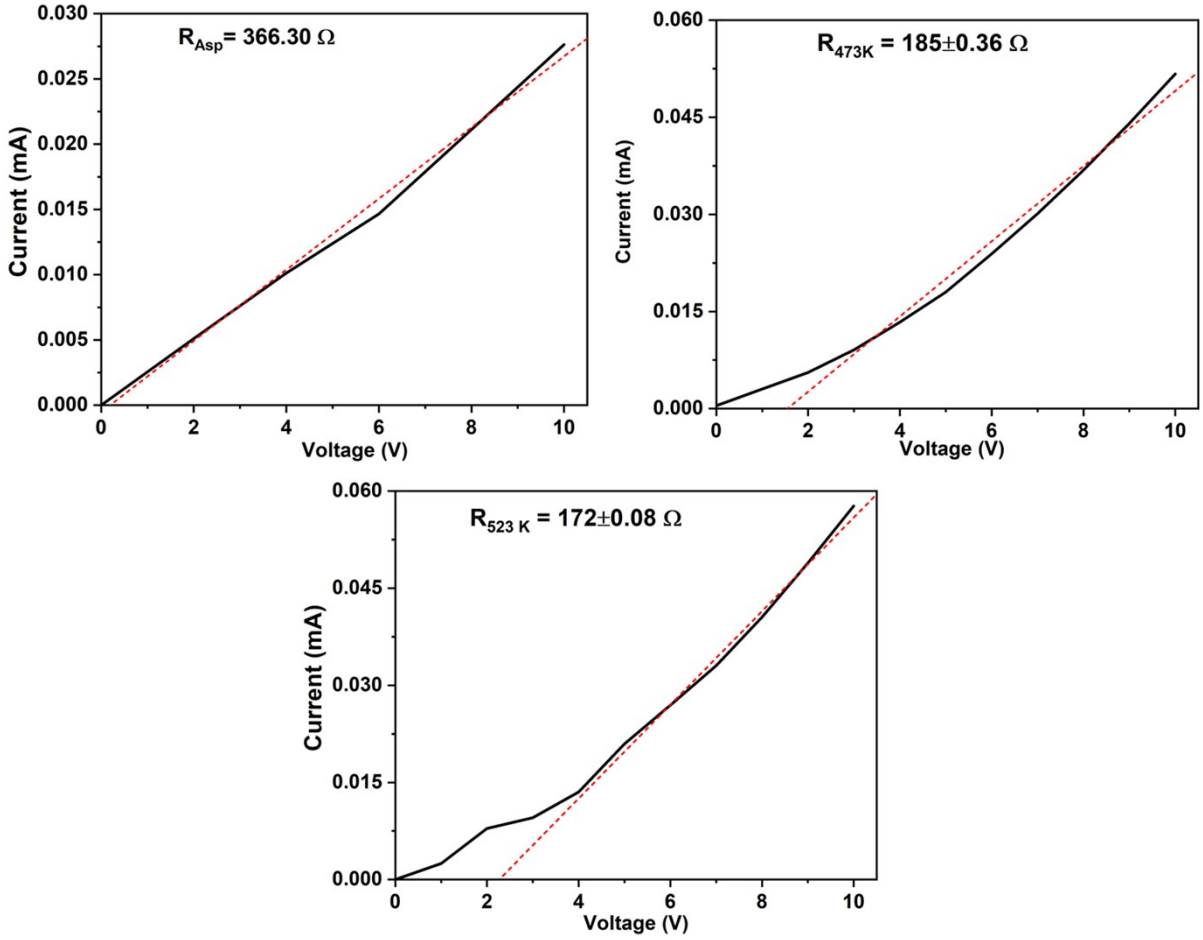

Fig. S5 Resistance measurement of (a) as-grown, (b) 473 K and (c) 523 K annealed Bi_2Te_3 thin films

Table S1. Comparative study of parameters for Bi_2Te_3 photodetector applications

Material	Synthesis Techniques	Detectivity (Jones)	Responsivity (AW^{-1})	EQE (%)	Wavelength (nm)	Ref.
Bi_2Te_3/Si	MBE		3.64×10^{-3}	0.9	1064	[1]
			3.32×10^{-2}	7.4	1550	
Bi_2Te_3 nanoplates	Solvothermal		395×10^{-6}		365	[2]
Bi_2Te_3 nanoplates	vdWe	5.92×10^{7}	55.06×10^{-3}		850	[3]
Bi_2Te_3 nanoplates	CVD	1.54×10^{10}	23.43		650	[4]
Graphene-Bi_2Te_3	CVD		35		532	[5]
Bi_2Te_3 nanosheets	FIB milling	1.29×10^{9}	26.82	102	325	[6]
		1.5×10^{9}	24.72	57.72	532	
		3.8×10^{9}	74.32	59.56	1550	
Bi_2Te_3 Nanowire		4×10^{9}	238	909.611	325	
		4.5×10^{9}	251	586.15	532	
		1.2×10^{9}	778	623.59	1550	
Bi_2Te_3	Vapor solid method	6.6×10^{9}	286		1550	[7]
Bi_2Te_3/PbS QDs	Colloidal	1.6×10^{9}	16×10^{-3}		660	[8]
		1.35×10^{10}	13.5×10^{-3}		850	
Bi_2Te_3/graphene	Hydrothermal		2.2×10^{-3}		Xenon lamp(150W)	[9]
Bi_2Te_3/pentacene			14.89	2840	450-3500	[10]
Gr/Bi_2Te_3/GaAs	Epitaxial growth	3.1×10^{12}	667.5×10^{-3}		785	[11]
		3.41×10^{10}	6.69×10^{-3}		1550	

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