Supporting information

Tuning of the optoelectronic properties for transparent oxide semiconductor $ASnO_3$ by modulating the size of A-ions

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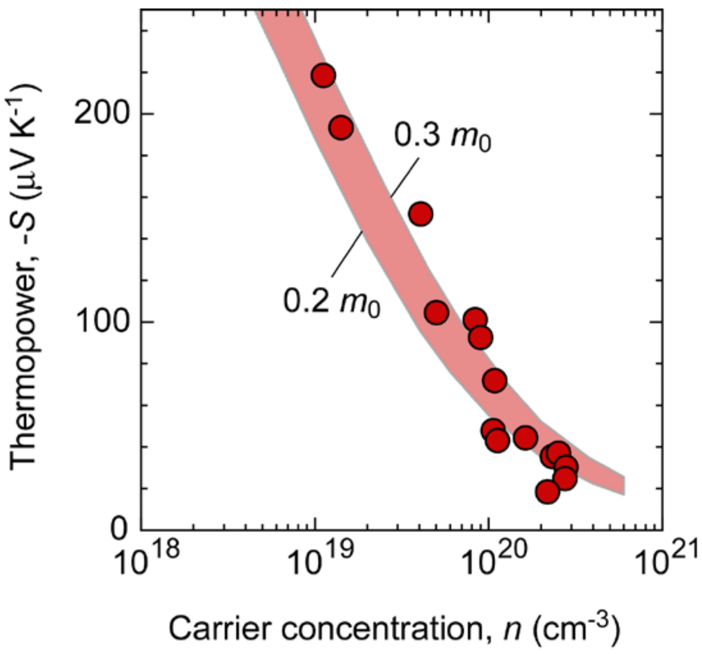

Figure S1. Thermopower ($-S$) of the resultant films as a function of carrier concentration (n) at room temperature. The carrier effective mass (m^*) of the films are in the range from 0.2 to 0.3 m_0.

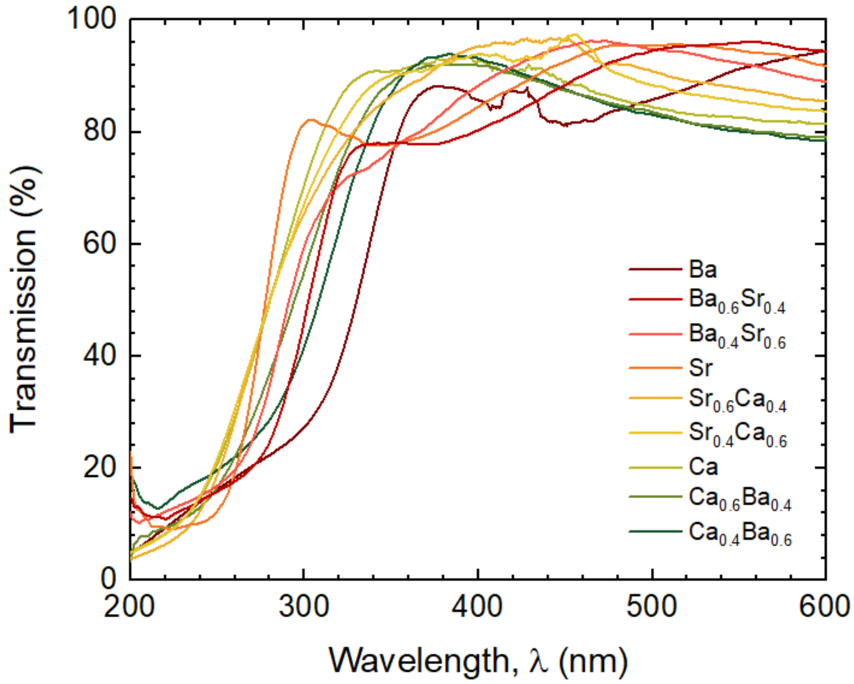

Figure S2. Optical transmission spectra of the resultant films (film thickness: 100nm).

Table S1. Crystallographic analyses of the resultant films.

Composition	Average ionic radius of *A*-site ion (Å)	$(a^2c)^{1/3}$ (Å)	*D* (nm)
$CaSnO_3$	1.34	3.949	20.2
$Ca_{0.8}Sr_{0.2}SnO_3$	1.36	3.973	21.1
$Ca_{0.6}Sr_{0.4}SnO_3$	1.38	4.002	23.5
$Ca_{0.4}Sr_{0.6}SnO_3$	1.40	4.014	17.6
$Ca_{0.2}Sr_{0.8}SnO_3$	1.42	4.031	31.1
$SrSnO_3$	1.44	4.033	33.6
$Sr_{0.8}Ba_{0.2}SnO_3$	1.47	4.052	22.4
$Sr_{0.6}Ba_{0.4}SnO_3$	1.51	4.092	24.2
$Sr_{0.4}Ba_{0.6}SnO_3$	1.54	4.132	27.7
$Sr_{0.2}Ba_{0.8}SnO_3$	1.58	4.107	31.3
$BaSnO_3$	1.61	4.138	24.3
$Ba_{0.8}Ca_{0.2}SnO_3$	1.56	4.129	24.6
$Ba_{0.6}Ca_{0.4}SnO_3$	1.50	4.090	27.0
$Ba_{0.4}Ca_{0.6}SnO_3$	1.45	4.066	39.1
$Ba_{0.2}Ca_{0.8}SnO_3$	1.39	3.998	22.7

D: lateral coherence length

Table S2. Optical transmission in wavelength of 260 nm and bandgap of the resultant films.

Composition	Transmission, *T* (%)	E_g (eV)
$CaSnO_3$	28.9	4.64
$Ca_{0.8}Sr_{0.2}SnO_3$	29.2	4.66
$Ca_{0.6}Sr_{0.4}SnO_3$	30.4	4.66
$Ca_{0.4}Sr_{0.6}SnO_3$	28.1	4.57
$Ca_{0.2}Sr_{0.8}SnO_3$	26.8	4.53
$SrSnO_3$	15.1	4.43
$Sr_{0.8}Ba_{0.2}SnO_3$	13.6	4.25
$Sr_{0.6}Ba_{0.4}SnO_3$	18.0	4.17
$Sr_{0.4}Ba_{0.6}SnO_3$	17.0	3.97
$Sr_{0.2}Ba_{0.8}SnO_3$	16.6	3.77
$BaSnO_3$	18.3	3.59
$Ba_{0.8}Ca_{0.2}SnO_3$	23.3	3.73
$Ba_{0.6}Ca_{0.4}SnO_3$	22.2	3.99
$Ba_{0.4}Ca_{0.6}SnO_3$	21.8	4.35
$Ba_{0.2}Ca_{0.8}SnO_3$	28.5	4.55

Table S3. Activation energy of the electrical conductivity for the resultant films.

Composition	E_a (meV)
$Ca_{0.7}Sr_{0.3}SnO_3$	22.25
$Ca_{0.5}Sr_{0.5}SnO_3$	3.12
$Ca_{0.4}Sr_{0.6}SnO_3$	-1.49
$Ca_{0.3}Sr_{0.7}SnO_3$	-5.55
$Ca_{0.2}Sr_{0.8}SnO_3$	-5.78
$Ca_{0.1}Sr_{0.9}SnO_3$	-7.58
$SrSnO_3$	-20.11
$Sr_{0.8}Ba_{0.2}SnO_3$	-2.17
$Sr_{0.6}Ba_{0.4}SnO_3$	-2.65
$Sr_{0.4}Ba_{0.6}SnO_3$	-10.14
$Sr_{0.2}Ba_{0.8}SnO_3$	-11.14
$BaSnO_3$	-14.48
$Ba_{0.8}Ca_{0.2}SnO_3$	-5.61
$Ba_{0.6}Ca_{0.4}SnO_3$	-0.12
$Ba_{0.4}Ca_{0.6}SnO_3$	13.68