

APPENDICE A  
CALCULATION DATA OF THERMOELECTRIC PROPERTIES

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## Data of thermoelectric properties for CMO cubic structure

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.2478	-825.99	27.17	0.0002	18.53
320	0.2474	-773.42	39.32	0.0003	23.52
340	0.2471	-726.98	54.70	0.0004	28.91
360	0.2468	-685.64	73.62	0.0006	34.60
380	0.2464	-648.60	96.34	0.0008	40.53
400	0.2460	-615.22	123.08	0.0012	46.58
420	0.2456	-584.96	154.04	0.0015	52.71
440	0.2452	-557.42	189.34	0.0020	58.83
460	0.2448	-532.23	229.10	0.0025	64.89
480	0.2443	-509.09	273.41	0.0032	70.86
500	0.2438	-487.77	322.31	0.0039	76.68
520	0.2433	-468.05	375.83	0.0047	82.33
540	0.2428	-449.76	434.00	0.0057	87.79
560	0.2423	-432.73	496.80	0.0067	93.03
580	0.2417	-416.85	564.22	0.0079	98.04
600	0.2411	-401.99	636.22	0.0093	102.81
620	0.2406	-388.06	712.77	0.0107	107.34
640	0.2399	-374.977	793.82	0.0123	111.61
660	0.2393	-362.651	879.32	0.0141	115.64
680	0.2386	-351.021	969.21	0.0160	119.42
700	0.2380	-340.028	1063.43	0.0181	122.95

Data of thermoelectric properties for CMO cubic structure (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
299.37	2.43	2.43	0.0022
348.92	2.37	2.37	0.0034
372.52	2.10	2.10	0.0061
398.61	1.80	1.80	0.0089
429.63	1.55	1.55	0.0128
455.69	1.34	1.35	0.0198
487.93	1.18	1.19	0.0266
512.74	1.03	1.04	0.0348
548.70	0.84	0.85	0.0530
585.86	0.80	0.81	0.0672
620.54	0.77	0.78	0.0813
650.26	0.77	0.78	0.0922
699.83	0.67	0.69	0.1210

Data of thermoelectric properties for CMO orthorhombic structure

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.3484	-691.33	40.52	0.0003	19.36
320	0.3482	-647.72	58.63	0.0005	24.60
340	0.3480	-609.21	81.56	0.0007	30.27
360	0.3477	-574.96	109.77	0.0010	36.29
380	0.3475	-544.30	143.65	0.0013	42.56
400	0.3472	-516.68	183.53	0.0018	48.99
420	0.3469	-491.67	229.68	0.0024	55.52
440	0.3466	-468.91	282.32	0.0030	62.08
460	0.3463	-448.12	341.61	0.0038	68.60
480	0.3460	-429.04	407.67	0.0048	75.04
500	0.3456	-411.47	480.58	0.0059	81.37
520	0.3453	-395.24	560.39	0.0071	87.54
540	0.3449	-380.19	647.12	0.0085	93.54
560	0.3445	-366.20	740.75	0.0101	99.34
580	0.3441	-353.17	841.27	0.0119	104.93
600	0.3437	-340.99	948.63	0.0139	110.30
620	0.3433	-329.58	1062.77	0.0161	115.44
640	0.3428	-318.87	1183.62	0.0185	120.35
660	0.3424	-308.80	1311.11	0.0211	125.02
680	0.3419	-299.30	1445.14	0.0240	129.46
700	0.3414	-290.34	1585.62	0.0271	133.67

Data of thermoelectric properties for CMO orthorhombic structure (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
299.38	2.43	2.43	0.0024
348.93	2.37	2.37	0.0036
372.53	2.11	2.11	0.0064
398.61	1.81	1.81	0.0094
429.63	1.56	1.56	0.0135
455.69	1.35	1.35	0.0209
487.93	1.19	1.19	0.0281
512.74	1.04	1.04	0.0369
548.70	0.85	0.85	0.0562
585.87	0.80	0.81	0.0715
620.55	0.77	0.79	0.0867
650.27	0.77	0.79	0.0987
699.83	0.67	0.70	0.1295

## Data of thermoelectric properties for CNTs-added CMO

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.1871	-498.95	295.78	0.0022	73.63
320	0.1867	-466.76	398.44	0.0031	86.81
340	0.1863	-438.31	520.38	0.0043	99.97
360	0.1858	-412.96	662.21	0.0058	112.93
380	0.1854	-390.22	824.32	0.0076	125.52
400	0.1849	-369.71	1006.91	0.0098	137.63
420	0.1843	-351.10	1210.04	0.0124	149.16
440	0.1838	-334.13	1433.64	0.0154	160.06
460	0.1832	-318.60	1677.55	0.0188	170.28
480	0.1826	-304.31	1941.55	0.0227	179.80
500	0.1820	-291.13	2225.34	0.0271	188.62
520	0.1813	-278.92	2528.61	0.0321	196.72
540	0.1806	-267.58	2850.98	0.0376	204.13
560	0.1799	-257.02	3192.09	0.0436	210.86
580	0.1792	-247.14	3551.55	0.0503	216.93
600	0.1784	-237.89	3928.97	0.0575	222.35
620	0.1776	-229.20	4323.95	0.0654	227.16
640	0.1768	-221.03	4736.12	0.0740	231.38
660	0.1760	-213.32	5165.08	0.0832	235.03
680	0.1751	-206.03	5610.47	0.0931	238.15
700	0.1742	-199.13	6071.93	0.1037	240.76

Data of thermoelectric properties for CNTs-added CMO (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
300.00	1.32	1.32	0.0167
352.53	1.19	1.19	0.0256
401.01	1.08	1.09	0.0415
453.54	0.98	1.00	0.0571
500.00	0.87	0.90	0.0764
550.51	0.81	0.86	0.1028
603.03	0.74	0.79	0.1292
651.52	0.67	0.76	0.1546
700.00	0.61	0.71	0.1943

Data of thermoelectric properties for C-substitute CMO case #1

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.2428	-674.32	135.12	0.0010	61.44
320	0.2424	-631.37	195.54	0.0015	77.95
340	0.2421	-593.42	272.02	0.0023	95.79
360	0.2418	-559.65	366.09	0.0032	114.66
380	0.2414	-529.38	479.08	0.0044	134.26
400	0.2410	-502.10	612.07	0.0060	154.31
420	0.2406	-477.38	765.99	0.0078	174.56
440	0.2402	-454.87	941.53	0.0101	194.81
460	0.2397	-434.28	1139.26	0.0128	214.86
480	0.2393	-415.37	1359.57	0.0159	234.57
500	0.2388	-397.94	1602.73	0.0196	253.80
520	0.2383	-381.82	1868.90	0.0237	272.46
540	0.2377	-366.86	2158.13	0.0284	290.45
560	0.2372	-352.94	2470.41	0.0338	307.73
580	0.2366	-339.95	2805.65	0.0397	324.24
600	0.2360	-327.80	3163.69	0.0463	339.95
620	0.2354	-316.41	3544.34	0.0536	354.85
640	0.2348	-305.70	3947.38	0.0616	368.90
660	0.2341	-295.62	4372.54	0.0704	382.13
680	0.2335	-286.11	4819.53	0.0800	394.51
700	0.2328	-277.11	5288.04	0.0903	406.08



Data of thermoelectric properties for C-substitute CMO case #1 (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
300.00	1.27	1.28	0.0144
352.53	1.16	1.16	0.0233
401.01	1.07	1.07	0.0397
469.70	0.95	0.96	0.0556
506.06	0.90	0.92	0.0723
558.59	0.83	0.86	0.1032
603.03	0.77	0.82	0.1282
647.47	0.72	0.78	0.1534
695.96	0.67	0.76	0.1957

Data of thermoelectric properties for C-substitute CMO case #2

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.1463	-406.48	122.22	0.0009	20.19
320	0.1458	-379.76	176.87	0.0014	25.51
340	0.1453	-356.10	246.05	0.0020	31.20
360	0.1447	-335.00	331.14	0.0029	37.16
380	0.1441	-316.04	433.33	0.0040	43.28
400	0.1435	-298.92	553.63	0.0054	49.47
420	0.1428	-283.36	692.85	0.0071	55.63
440	0.1421	-269.15	851.64	0.0091	61.69
460	0.1414	-256.12	1030.49	0.0116	67.60
480	0.1406	-244.12	1229.76	0.0144	73.29
500	0.1398	-233.02	1449.71	0.0177	78.72
520	0.1390	-222.73	1690.46	0.0214	83.86
540	0.1381	-213.14	1952.08	0.0257	88.68
560	0.1372	-204.20	2234.54	0.0305	93.17
580	0.1363	-195.82	2537.77	0.0359	97.31
600	0.1353	-187.96	2861.63	0.0419	101.10
620	0.1343	-180.56	3205.94	0.0485	104.52
640	0.1333	-173.58	3570.50	0.0558	107.58
660	0.1322	-166.98	3955.06	0.0637	110.28
680	0.1312	-160.73	4359.37	0.0723	112.62
700	0.1300	-154.80	4783.16	0.0817	114.62

Data of thermoelectric properties for C-substitute CMO case #2 (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
300.00	1.27	1.28	0.0047
352.53	1.16	1.16	0.0076
401.01	1.07	1.07	0.0129
469.70	0.95	0.96	0.0179
506.06	0.90	0.92	0.0232
558.59	0.83	0.86	0.0328
603.03	0.77	0.81	0.0405
647.47	0.72	0.78	0.0483
695.96	0.67	0.76	0.0609

Data of thermoelectric properties for C-substitute CMO case #3

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.2377	-660.30	134.44	0.0010	58.62
320	0.2374	-618.21	194.56	0.0015	74.36
340	0.2371	-581.02	270.65	0.0022	91.37
360	0.2367	-547.92	364.25	0.0032	109.35
380	0.2363	-518.25	476.67	0.0044	128.03
400	0.2359	-491.51	609.00	0.0059	147.12
420	0.2355	-467.28	762.14	0.0078	166.41
440	0.2351	-445.21	936.80	0.0101	185.68
460	0.2346	-425.02	1133.54	0.0127	204.76
480	0.2341	-406.48	1352.74	0.0158	223.51
500	0.2336	-389.39	1594.68	0.0195	241.79
520	0.2331	-373.58	1859.51	0.0236	259.52
540	0.2326	-358.91	2147.29	0.0283	276.61
560	0.2320	-345.26	2458.00	0.0336	293.00
580	0.2314	-332.52	2791.55	0.0395	308.66
600	0.2308	-320.60	3147.79	0.0461	323.54
620	0.2302	-309.42	3526.53	0.0533	337.64
640	0.2296	-298.92	3927.55	0.0613	350.93
660	0.2289	-289.02	4350.56	0.0701	363.42
680	0.2282	-279.69	4795.31	0.0796	375.11
700	0.2275	-270.86	5261.47	0.0899	386.00

Data of thermoelectric properties for C-substitute CMO case #3 (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
300.00	1.27	1.28	0.0138
352.53	1.16	1.16	0.0223
401.01	1.07	1.07	0.0379
469.70	0.95	0.96	0.0530
506.06	0.90	0.92	0.0689
558.59	0.83	0.86	0.0984
603.03	0.77	0.82	0.1222
647.47	0.72	0.78	0.1463
695.96	0.67	0.76	0.1865

Data of thermoelectric properties for C-substitute CMO case #4

T (K)	$E_F$ (eV)	$S$ ( $\mu\text{V K}^{-1}$ )	$\sigma$ ( $\text{S m}^{-1}$ )	$\kappa_e$ ( $\text{W m}^{-1} \text{K}^{-1}$ )	$PF$ ( $\text{W m}^{-1} \text{K}^{-2}$ )
300	0.1206	-402.00	118.83	0.0009	19.20
320	0.1200	-374.98	171.96	0.0013	24.18
340	0.1193	-351.02	239.21	0.0020	29.47
360	0.1187	-329.62	321.94	0.0028	34.98
380	0.1179	-310.37	421.30	0.0039	40.58
400	0.1172	-292.94	538.26	0.0053	46.19
420	0.1164	-277.08	673.61	0.0069	51.72
440	0.1155	-262.58	827.98	0.0089	57.09
460	0.1147	-249.25	1001.86	0.0112	62.24
480	0.1137	-236.94	1195.60	0.0140	67.12
500	0.1128	-225.55	1409.44	0.0172	71.70
520	0.1118	-214.96	1643.50	0.0209	75.94
540	0.1107	-205.08	1897.86	0.0250	79.82
560	0.1097	-195.83	2172.47	0.0297	83.31
580	0.1086	-187.16	2467.28	0.0349	86.42
600	0.1074	-178.99	2782.14	0.0407	89.14
620	0.1062	-171.30	3116.89	0.0472	91.46
640	0.1050	-164.02	3471.32	0.0542	93.38
660	0.1037	-157.12	3845.20	0.0619	94.93
680	0.1024	-150.57	4238.28	0.0703	96.09
700	0.1010	-144.34	4650.29	0.0794	96.89

Data of thermoelectric properties for C-substitute CMO case #4 (continue)

T (K)	$\kappa_{lat}$ (W m <sup>-1</sup> K <sup>-1</sup> )	$\kappa_{tot}$ (W m <sup>-1</sup> K <sup>-1</sup> )	ZT
300.00	1.27	1.28	0.0045
352.53	1.16	1.16	0.0072
401.01	1.07	1.07	0.0121
469.70	0.95	0.96	0.0168
506.06	0.90	0.92	0.0217
558.59	0.83	0.86	0.0304
603.03	0.77	0.81	0.0374
647.47	0.72	0.78	0.0443
695.96	0.67	0.75	0.0553