Supporting Information

Investigation of Thermoelectric Performance and Power Generation Characteristics of Dual-Doped $Ca_{1-x}RE'_{x/2}RE''_{x/2}MnO_3$ (RE'/RE'' = Dy, Gd, Yb, Lu; $0.05 \leq x \leq 0.1$)

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Table S1. Comparison of thermoelectric performances of $CaMnO_3$ with respect to doping and synthesis methodology

Synthesis methodology	Compositions	Power factor at 973 K ($\mu Wm^{-1}K^{-2}$)	Reference
Solid State Synthesis	$Ca_{0.9}Yb_{0.1}MnO_3$	300	20
	$Ca_{0.9}Dy_{0.1}MnO_3$	360	20
	$Ca_{0.97}Bi_{0.03}MnO_3$	465	29
	$CaMn_{0.98}Nb_{0.02}O_3$	120	30
	$CaMn_{0.96}Ta_{0.04}O_3$	85	30
	$CaMn_{0.99}W_{0.01}O_3$	340	31
	$Ca_{0.8}Sr_{0.1}Yb_{0.1}MnO_3$	220	19
	$Ca_{0.9}Yb_{0.05}Dy_{0.05}MnO_3$	345	23
	$Ca_{0.96}Dy_{0.02}Bi_{0.02}MnO_3$	420	37
	$CaMn_{0.96}Nb_{0.02}Ta_{0.02}O_3$	200	31
	$Ca_{0.95}Yb_{0.05}Mn_{0.98}Nb_{0.02}O_3$	140	30
	$Ca_{0.98}Lu_{0.02}Mn_{0.98}Nb_{0.02}O_3$	125	30
	$Ca_{0.96}Gd_{0.04}Mn_{0.96}Nb_{0.04}O_3$	225	29
	$Ca_{0.96}Bi_{0.04}Mn_{0.96}Nb_{0.04}O_3$	200	33
Co-precipitation	$Ca_{0.96}Gd_{0.04}MnO_3$	310	22
Sol-gel Methodology	$CaMn_{0.98}Nb_{0.02}O_3$	202	17
	$Ca_{0.9}Yb_{0.05}Lu_{0.05}MnO_3$	580	This paper
	$Ca_{0.9}Dy_{0.05}Lu_{0.05}MnO_3$	545	This paper
	$Ca_{0.9}Dy_{0.05}Yb_{0.05}MnO_3$	560	This paper
	$Ca_{0.9}Gd_{0.05}Lu_{0.05}MnO_3$	530	This paper
	$Ca_{0.9}Gd_{0.05}Yb_{0.05}MnO_3$	475	This paper
	$Ca_{0.9}Dy_{0.05}Gd_{0.05}MnO_3$	460	This paper

Figure S1

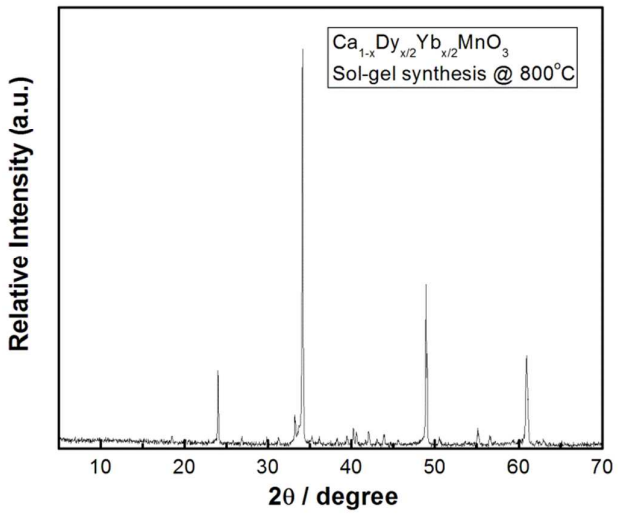

Figure S1. XRD pattern of sol-gel synthesized $Ca_{0.9}RE'_{0.05}RE''_{0.05}MnO_3$ after heat treatment of 800ºC

Figure S2

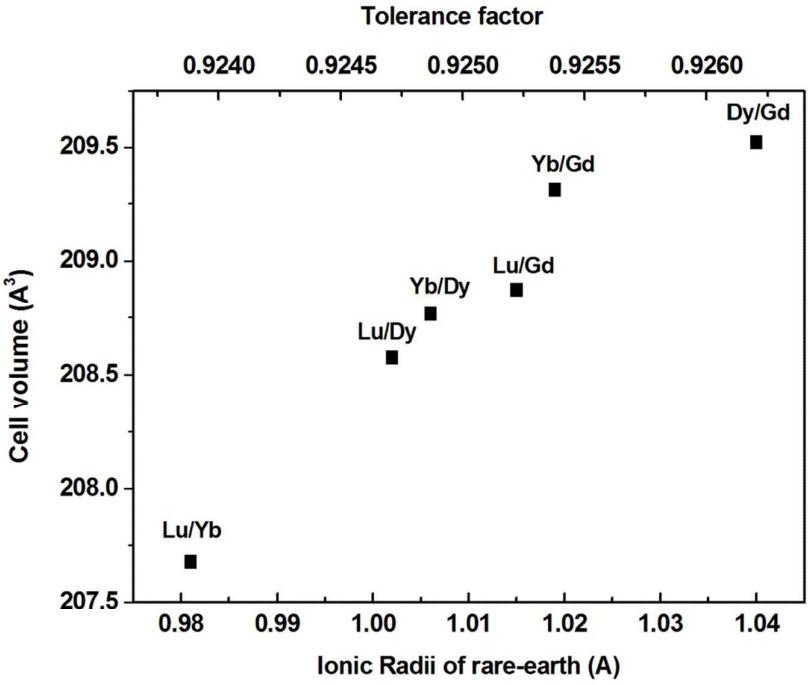

Figure S2. Unit cell volume (V) of $Ca_{0.9}RE'_{0.05}RE''_{0.05}MnO_3$ (RE'/RE'' = Yb/Lu, Dy/Lu, Dy/Yb, Gd/Lu, Gd/Yb, Gd/Dy) as a function of ionic radii of rare-earth ions and tolerance factor (t).

Figure S3

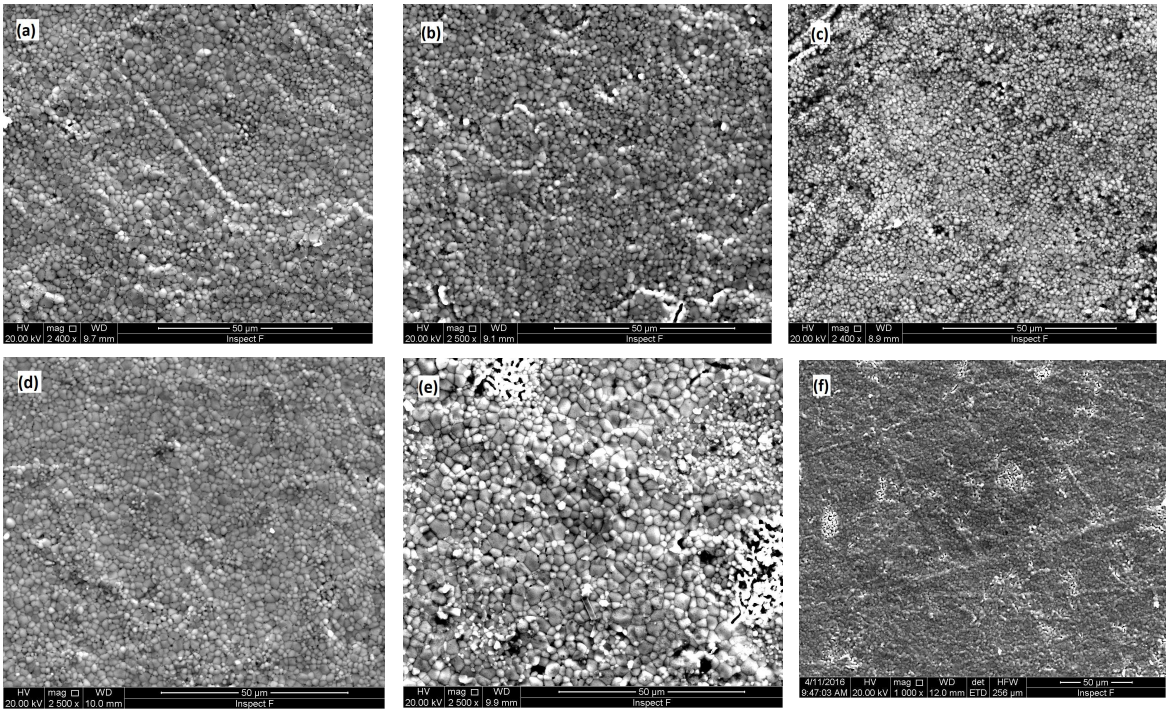

Figure S3. SEM micrographs showing sintered pellets under equivalent magnification: (a) $Ca_{0.95}Dy_{0.025}Yb_{0.025}MnO_3$, (b) $Ca_{0.95}Gd_{0.025}Lu_{0.025}MnO_3$, (c) $Ca_{0.9}Dy_{0.05}Gd_{0.05}MnO_3$, (d) $Ca_{0.9}Dy_{0.05}Lu_{0.05}MnO_3$, (e) $Ca_{0.9}Gd_{0.05}Yb_{0.05}MnO_3$ and (f) $Ca_{0.9}Yb_{0.05}Lu_{0.05}MnO_3$