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Supporting Information

Giant High-temperature Piezoelectricity in Perovskite oxides for Vibration Energy Harvesting

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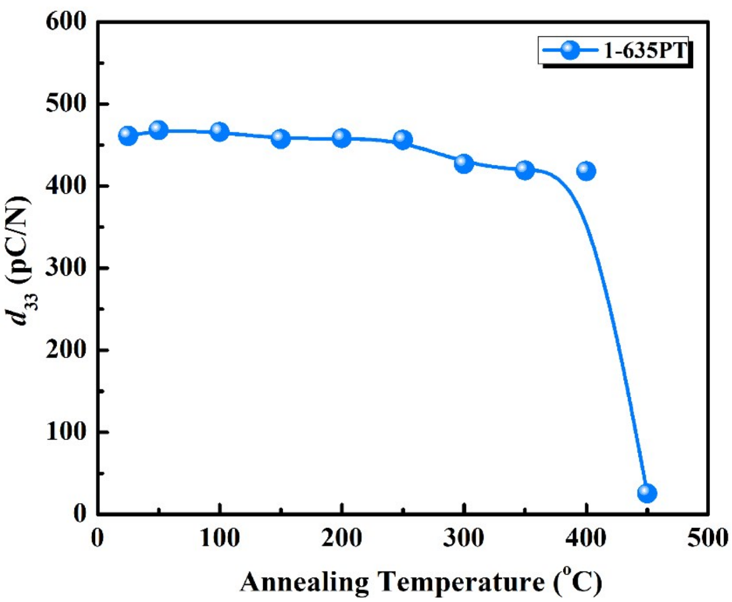

Fig. S1. Variation of the d_{33} of 1-635PT sample as a function of annealing temperature.

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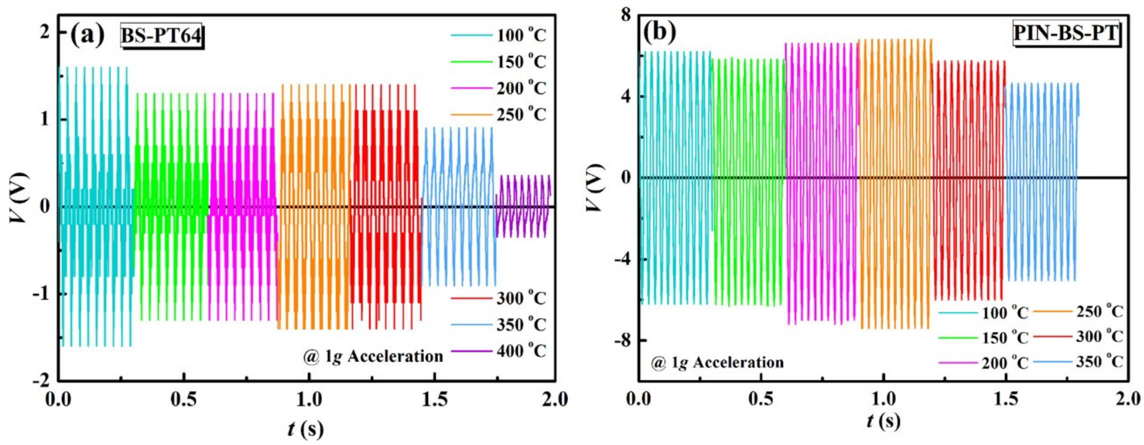

Fig. S2. The open output voltage as a function of temperature for (a) BS-PT64 harvester[1] and (b) PIN-BS-PT harvester at resonate frequencies under 1*g* acceleration.

Table S1. Curie temperature and room temperature electrical properties of *z*BS-*x*PT-*y*BZH ceramics.

Serie	x	T_c (°C)	d_{33} (pC/N)	ε_r	tanδ
	0.620	418	280	1024	0.026
	0.625	424	366	1260	0.029
	0.630	430	457	1483	0.035
$y = 0.01$	0.635	431	461	1969	0.027
	0.640	432	356	1778	0.021
	0.645	433	299	1523	0.019
	0.650	442	265	1314	0.017
	0.620	422	383	1273	0.038
	0.625	426	456	1651	0.038
$y = 0.02$	0.630	431	377	1602	0.027
	0.635	432	310	1315	0.023
	0.640	432	297	1052	0.024
	0.615	416	363	1267	0.036
	0.620	417	421	1678	0.035
$y = 0.03$	0.625	419	369	1755	0.036
	0.630	423	335	1594	0.034
	0.635	426	306	1482	0.029

Table S2. The d_{33} values of piezoceramics at different test temperatures (T) by *in situ* method.

Composition	T_1(°C)	$d_{33\text{-}1}$ (pC/N)	T_2(°C)	$d_{33\text{-}2}$ (pC/N)	T_3(°C)	$d_{33\text{-}3}$ (pC/N)	Methods	Ref.
PZT5	~220	~700	—	—	—	—	quasi-static method	2
PZT8	~275	340	—	—	—	—	quasi-static method	3
PZT5	250	577	—	—	—	—	quasi-static method	3
PZN-PZT	200	385	350	43	—	—	quasi-static method	4
BYPT-PZ-La	~325	~325	—	—	—	—	quasi-static method	2
KNNL*x*-BZ-BNT	150	~270	—	—	—	—	quasi-static method	5
NBT-BT	90	129	—	—	—	—	quasi-static method	4
NBT-Fe	180	133	—	—	—	—	laser vibrometer	6
BCZT	45	332	100	88	—	—	quasi-static method	4
BZT-50BCT	25	620	70	620	—	—	quasi-static method	7
PN-La-Mn	~300	~100	—	—	—	—	quasi-static method	2
BMT-40PT	~350	370	—	—	—	—	laser vibrometer	8
BF-41PT	400	~150	—	—	—	—	laser vibrometer	8
BS-PT64	20	380	220	480	—	—	quasi-static method	7
BS-PT	~350	~800	—	—	—	—	quasi-static method	2
BS-PT63	~380	780	—	—	—	—	laser vibrometer	8
BSPTSingle crystal	400	1300	—	—	—	—	resonance method	9
BS-PT64	25	484	200	556	400	405	quasi-static method	This work
BS-PT-PIN	25	492	200	675	400	26	quasi-static method	
BZH-BS-PT	25	461	200	612	400	726	quasi-static method	

The $d_{33\text{-}1}$, $d_{33\text{-}2}$ and $d_{33\text{-}3}$ in the table correspond to the d_{33} values of the materials at three different test temperatures T_1, T_2 and T_3, respectively.

The unit of d_{33} value measured by laser vibrometer is pm/V.

Table S3. Rietveld refinement parameters of poled ceramics *in situ* measured at different temperatures (*T*) XRD.

Samples	*T* (°C)	Phase	Lattice parameters				Refined factors		
			a (Å)	*b* (Å)	*c* (Å)	*β* (°)	R_{wp}(%)	R_p(%)	χ^2
BS-PT64	200	*P*4*mm*	4.0037	4.0037	4.0745	90	6.32	4.58	3.26
		*R*3*mr*	4.0380	4.0380	4.0380	90.0725			
BS-PT64	400	*P*4*mm*	4.0191	0.0000	4.0631	90	7.15	5.04	3.70
		*R*3*mr*	4.0312	0.0000	0.0000	90.0466			
PIN-BS-PT	200	*P*4*mm*	4.0100	4.0100	4.0666	90	7.59	5.35	3.96
		*R*3*mr*	4.0359	4.0359	4.0359	89.9026			
PIN-BS-PT	400	*P*4*mm*	4.0231	4.0231	4.0584	90	10.44	6.81	5.43
		*R*3*mr*	4.0287	4.0287	4.0287	90.0298			
BS-PT-BZH	200	*P*4*mm*	4.0035	4.0035	4.0747	90	8.30	5.67	4.20
		*R*3*mr*	4.0400	4.0400	4.0400	89.8344			
BS-PT-BZH	400	*P*4*mm*	4.0142	4.0142	4.0542	90	8.81	6.20	4.41
		*R*3*mr*	4.0302	4.0302	4.0302	89.9337			

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