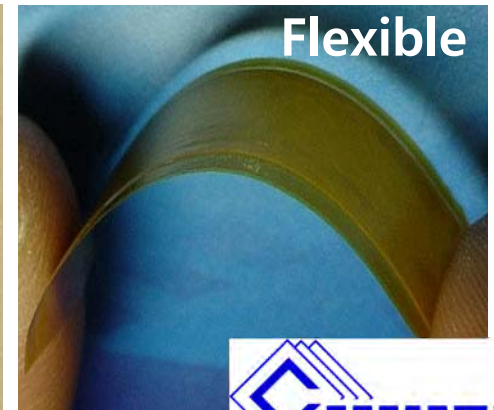
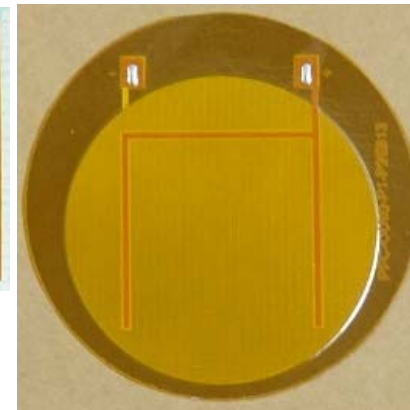
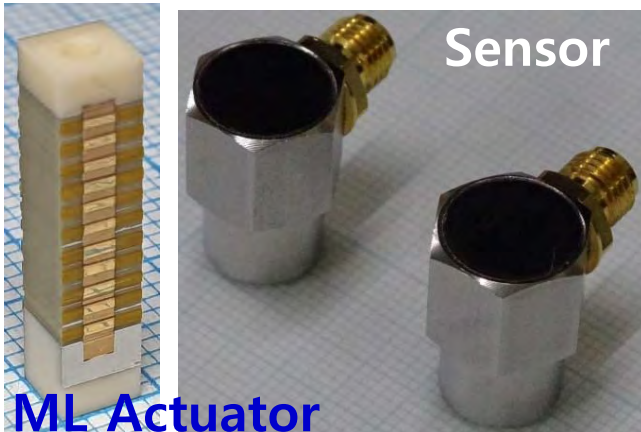
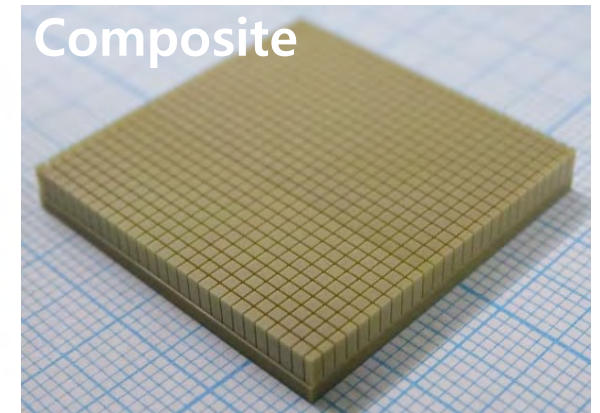
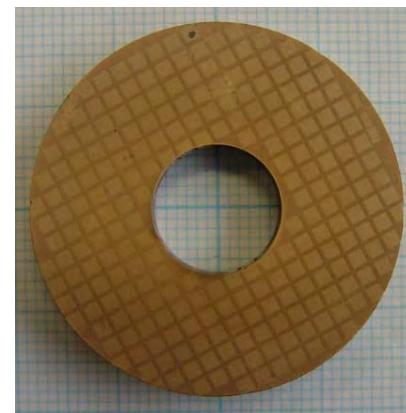
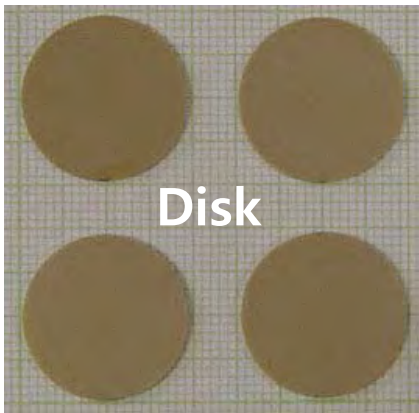
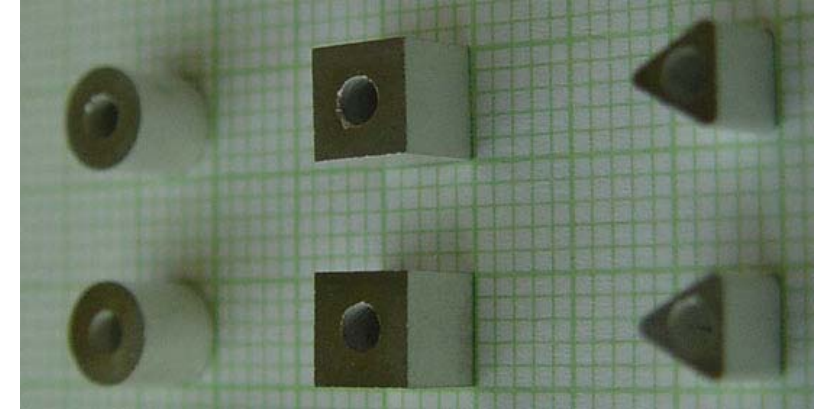
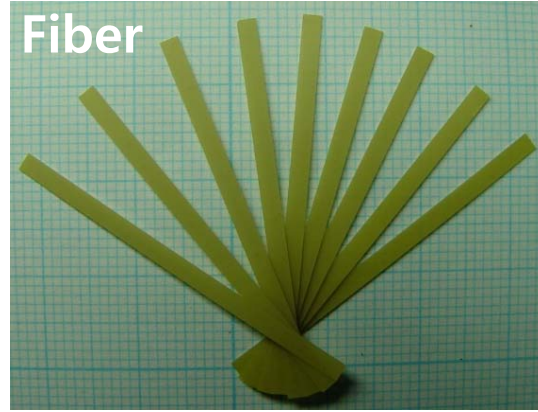
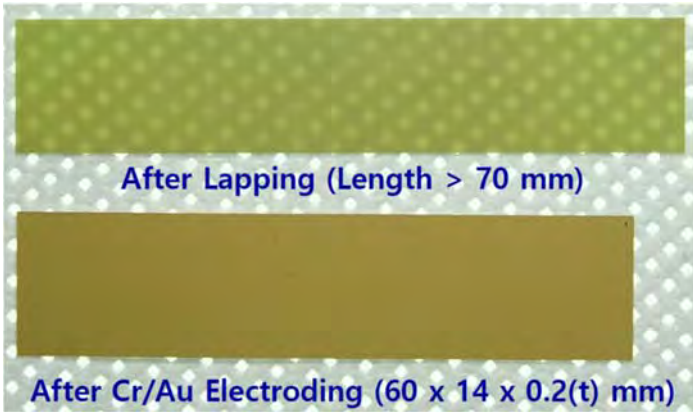


# Ceracomp Products: *Single Crystal, Sensor & Actuator*



## Ceracomp Piezoelectric Single Crystals (Soft, Semi-Hard & Hard)

Ceracomp Single Crystals	Soft Type SC							Semi-Hard Type SC				Hard Type SC		
	CSL10	CSL11	CSL20	CSL30	CSL40	CSL50	CSL60	CSM10	CSM40	CSM50	CSM60	CSH40	CSH50	CSH60
$K^T$ [ $\epsilon_{33}^T/\epsilon_0$ ]	5,500	6,000	10,000	8,000	6,500	5,500	4,500	5,000	4,000	3,000	2,500	3,000	2,500	2,000
$\tan \delta$ [%]	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.3	< 0.3	< 0.3
$T_C$ [°C]	140	140	130	150	160	180	200	140	160	180	200	160	180	200
$T_{RT}$ [°C]	85	80	75	85	100	120	135	80	100	120	135	100	120	135
$d_{33}$ [pC/N]	1,550	2,000	3,000	2,500	2,000	1,800	1,500	1,500	1,300	1,200	1,100	1,000	850	700
$d_{32}$ [pC/N]	-1,300	-1,300	-2,500	-2,000	-1,750	-1,600	-1,350	-1,300	-1,150	-1,000	-900	-900	-700	-600
$k_{33}$	0.9	0.9	0.94	0.93	0.92	0.91	0.9	0.9	0.9	0.89	0.88	0.88	0.86	0.85
$k_{32}$	0.88	0.88	0.9	0.9	0.9	0.88	0.88	0.88	0.88	0.87	0.86	0.85	0.84	0.8
$E_C$ [kV/cm]	2.5	3.0	3.0	3.5	4.0	4.0	5.0	4.0	4.0	5.0	5.0	5.0	6.0	6.0
$Q_m$	< 100	< 100	< 100	< 100	< 100	< 100	< 100	> 400	> 400	> 400	> 400	> 600	> 850	> 850

## Ceracomp Polycrystalline PZT Ceramics

Ceracomp PZT Ceramics	Soft PZT [CCL]									Semi-Hard PZT [CCM]			Hard PZT [CCH]	
	CCL10	CCL20	CCL30	CCL40	CCL50	CCL60	CCL70	CCL80	CCL90	CCM10	CCM30	CCM50	CCH10	CCH30
$K_3^T$ [ $\epsilon_{33}^T/\epsilon_0$ ]	2,500	3,000	3,500	4,000	4,500	5,500	7,500	9,000	10,000	2,500	3,000	3,500	1,000	1,500
tan $\delta$ [%]	1.8	2.0	2.0	2.0	2.0	2.0	3.0	2.5	3.5	0.5	0.5	0.7	0.4	0.6
$T_c$ [°C]	300	250	200	180	160	150	130	110	90	250	220	180	300	300
$d_{33}$ [pC/N]	500	600	700	800	950	1,000	1,050	1,200	1,350	450	600	750	250	300
$k_p$	0.68	0.68	0.68	0.68	0.72	0.72	0.7	0.67	0.67	0.62	0.65	0.65	0.6	0.63
$E_c$ [kV/cm]	10	8	7	7	6	6	5	5	5	8.5	7.5	6.5	15	12
$Q_m$	100	100	100	100	100	100	100	100	100	350	300	250	1,000	800

## Piezoelectric PMSC [Polycrystalline Matrix Single Crystal Composite]: *Under Development*

Ceracomp Single Crystals	Soft Type SC Composites						Semi-Hard Type SC Composites				Hard Type SC Composites		
	CXL10	CXL20	CXL30	CXL40	CXL50	CXL60	CXM10	CXM40	CXM50	CXM60	CXH40	CXH50	CXH60
$K^T$ [ $\epsilon_{33}^T/\epsilon_0$ ]	9,000	10,000	8,000	6,500	5,500	4,500	5,000	4,000	3,000	2,500	3,000	2,500	2,000
$\tan \delta$ [%]	< 2.5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.3	< 0.3	< 0.3
$T_c$ [°C]	110	130	150	160	180	200	140	160	180	200	160	180	200
$T_{RT}$ [°C]		75	85	100	120	135	85	100	120	135	100	120	135
$d_{33}$ [pC/N]	1,200	3,000	2,500	2,000	1,800	1,500	1,500	1,300	1,200	1,100	1,000	850	700
$d_{32}$ [pC/N]	-1,300	-2,500	-2,000	-1,750	-1,600	-1,350	-1,300	-1,150	-1,000	-900	-900	-700	-600
$k_{33}$	0.9	0.94	0.93	0.92	0.91	0.9	0.9	0.9	0.89	0.88	0.88	0.86	0.85
$k_{32}$	0.88	0.9	0.9	0.9	0.88	0.88	0.88	0.88	0.87	0.86	0.85	0.84	0.8
$E_c$ [kV/cm]	2.5	3.0	3.5	4.0	4.0	5.0	4.0	4.0	5.0	5.0	5.0	6.0	6.0
$Q_m$	< 100	< 100	< 100	< 100	< 100	< 100	> 400	> 400	> 400	> 400	> 600	> 850	> 850