Surface Modified Nanostructured Oxide in Functional Polymer for Piezoelectric Energy Harvesting and Human Gesture Sensing

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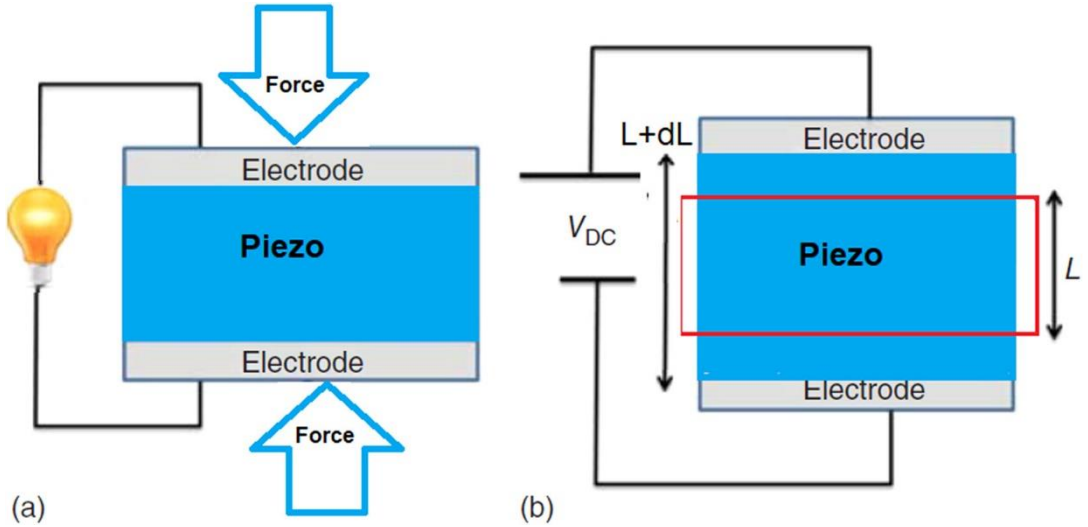
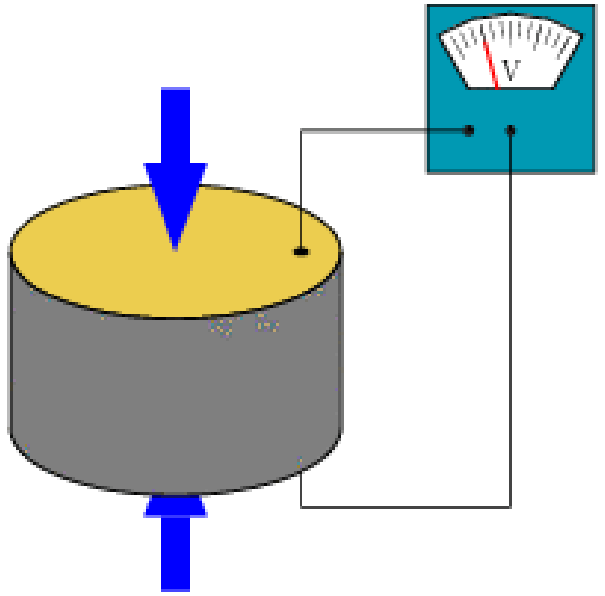




Piezoelectricity

ELECTRIC POLARIZATION IN A SUBSTANCE RESULTING FROM MECHANICAL STRESS.

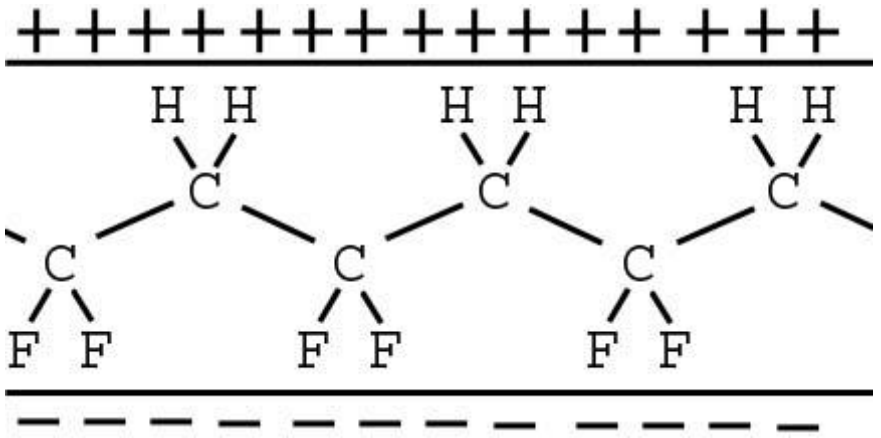
Piezoelectric Materials

RIGID

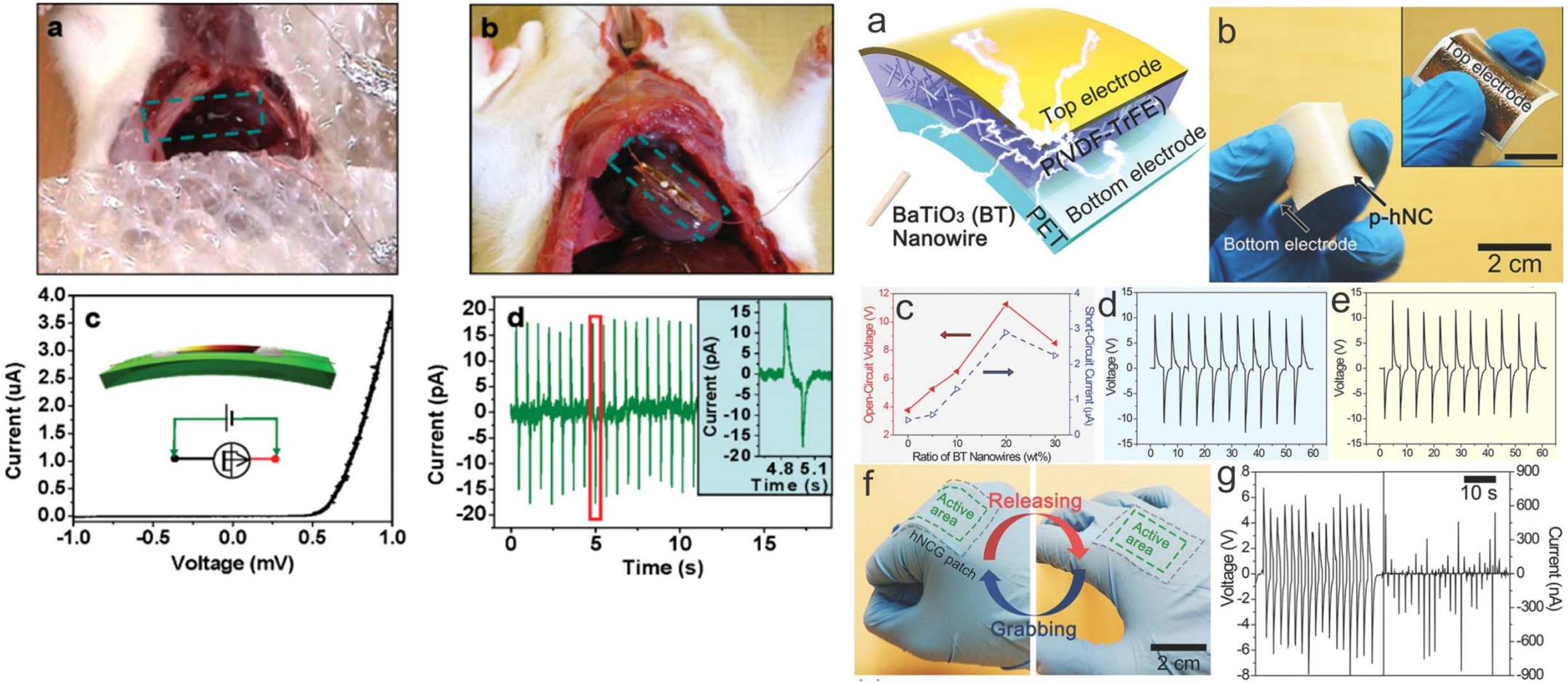
- Synthetic ceramics: $BaTiO_3$, $PbTiO_3$, $Pb(Zr,Ti)O_3$, $KNbO_3$, $LiNbO_3$, $LiTaO_3$, Na_2WO_3, ZnO
- Lead-free piezoceramics: $(K,Na)NbO_3$, $BiFeO_3$, $Bi_4Ti_3O_{12}$, $Na_{0.5}Bi_{0.5}TiO_3$, ZnO.

FLEXIBLE

- PVDF-Poly(vinylidene fluoride)



Recent Works in Flexible Piezolectrics

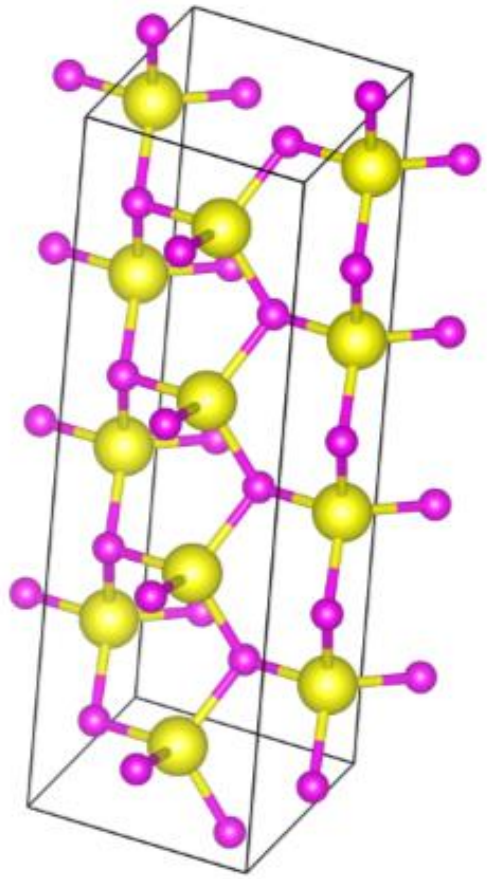


Procedure and Goals

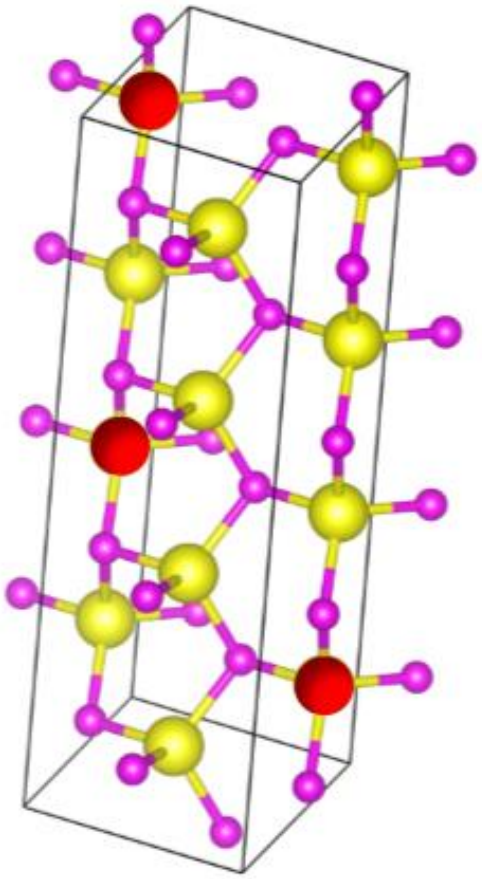
Preparing	Preparing the modified ZnO nanoparticle using wet chemical co precipitation method.
Incorporating	Incorporating modified ZnO into PVDF to produce flexible Piezoelectric film.
Using	Using MWCNT to increase conductivity.

Crystal Structure Modification

- ZnO is modified by replacing Zinc with other metal.
- New metal induces stress in the crystal structure.
- Stress is induced due to the mismatch of ionic radius.
- This induced stress results in higher piezoelectric response.



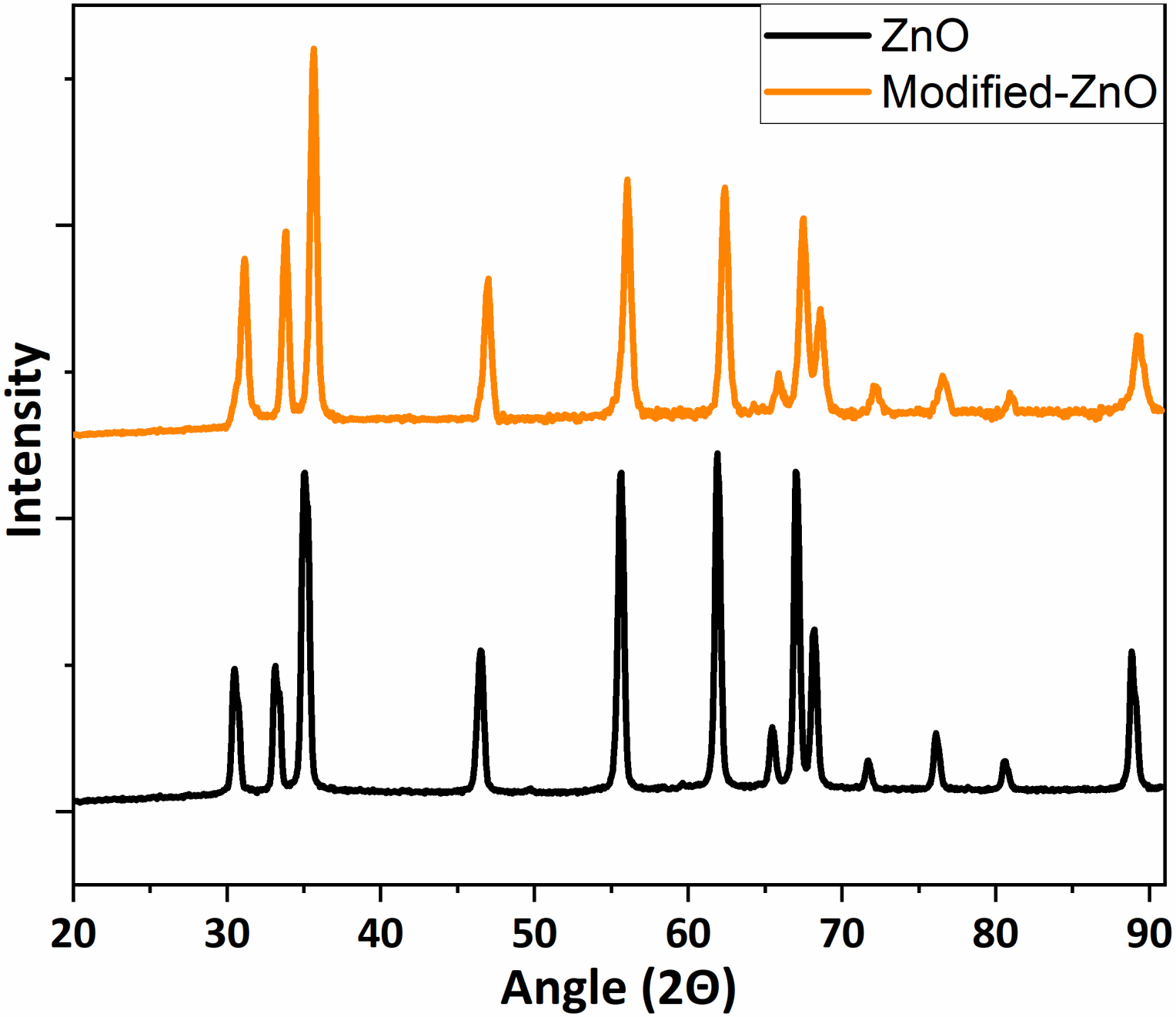
Zinc Oxide

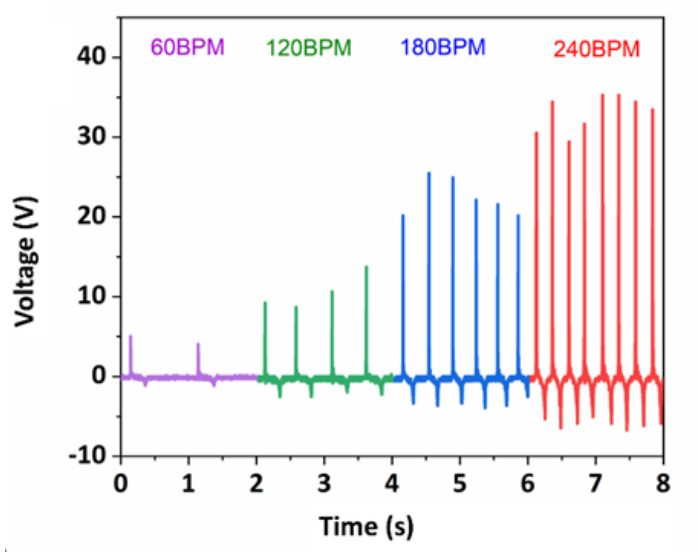


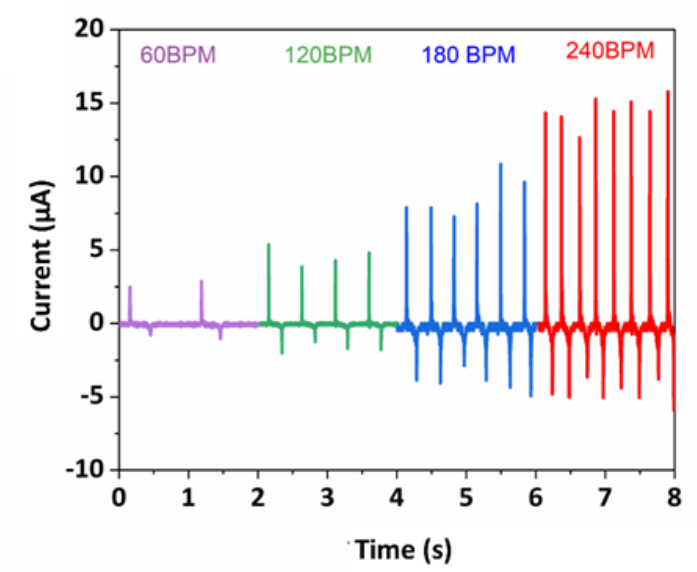
Modified Zinc Oxide

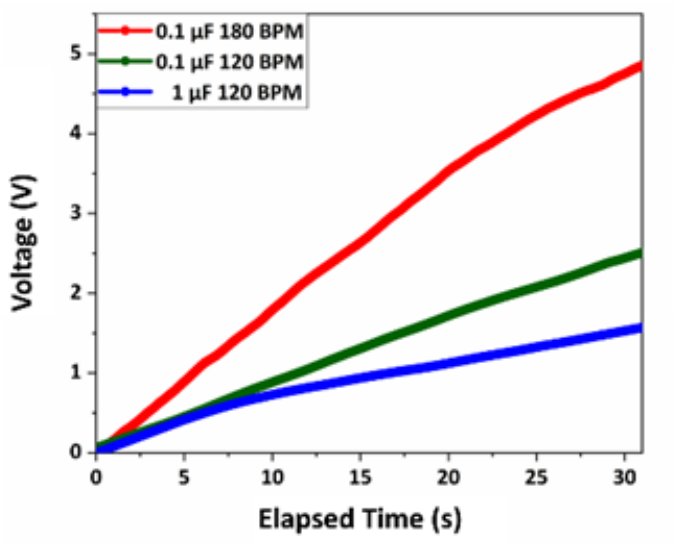
XRD Comparison

- Overall peak shifts to the right with change in intensity.
- Doping of metal induced overall shift.
- All peaks are retained indicating no change in crystal structure.









Electric Output

Conclusion

- Higher electrical output compared to basic ZnO based flexible piezoelectric films.
- Higher charging capacity.
- Higher sensitivity to force.
- Universal applicability.

References

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Thank You