

The 5th International Online Conference on Nanomaterials



22-24 September 2025 | Online



Enhanced structural and dielectric behavior in rGO incorporated $K_{0.5}Na_{0.5}NbO_3$ composite System

Neha Kumari ^a, Sahil Kumar ^a, Mamta Shandilya ^{a*}

^a School of Physics and Materials Science, Shoolini University of Biotechnology and Management Sciences, Solan 173229, India

1500

1000

500

20

30

INTRODUCTION & AIM Lead Free Perovskite High Piezoelectric Properties K+ or Na+ **Phase transition High Dielectric Constant** COOH High thermal Large Chemical surface stability area HOOC **Excellent Reduced Graphene Electrical** oxide(rGO) Conductivity To study the effect of rGO incorporation on the structural and dielectric properties of the $K_{0.5}Na_{0.5}NbO_3$ system **METHOD** Acetone PVDF-HFP **Stirring of precursors Electrospinning proces Prepared nanofibers** Prepared reduced graphene oxide Calcination of fibers Figure: Schematic representation of the synthesis of rGO. Calcined nanofibers Calcined KNN Powder as_rGO

Preparation of nanofibers via Electrospinning

Prepared nanofibers

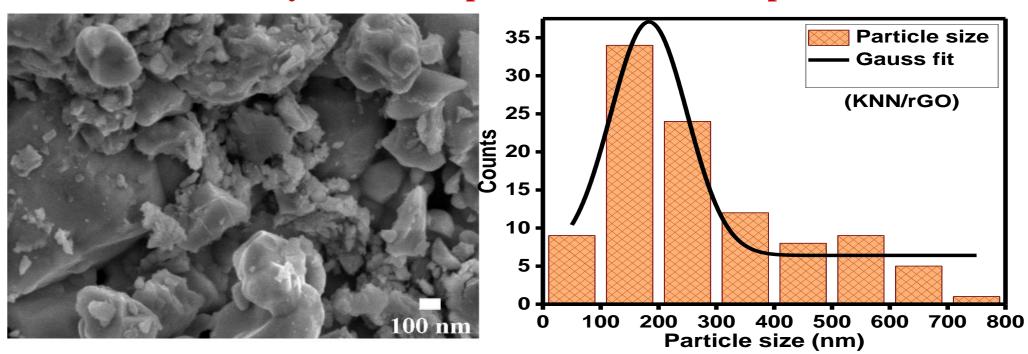
Via Electrospinning

Winds Strong Stron

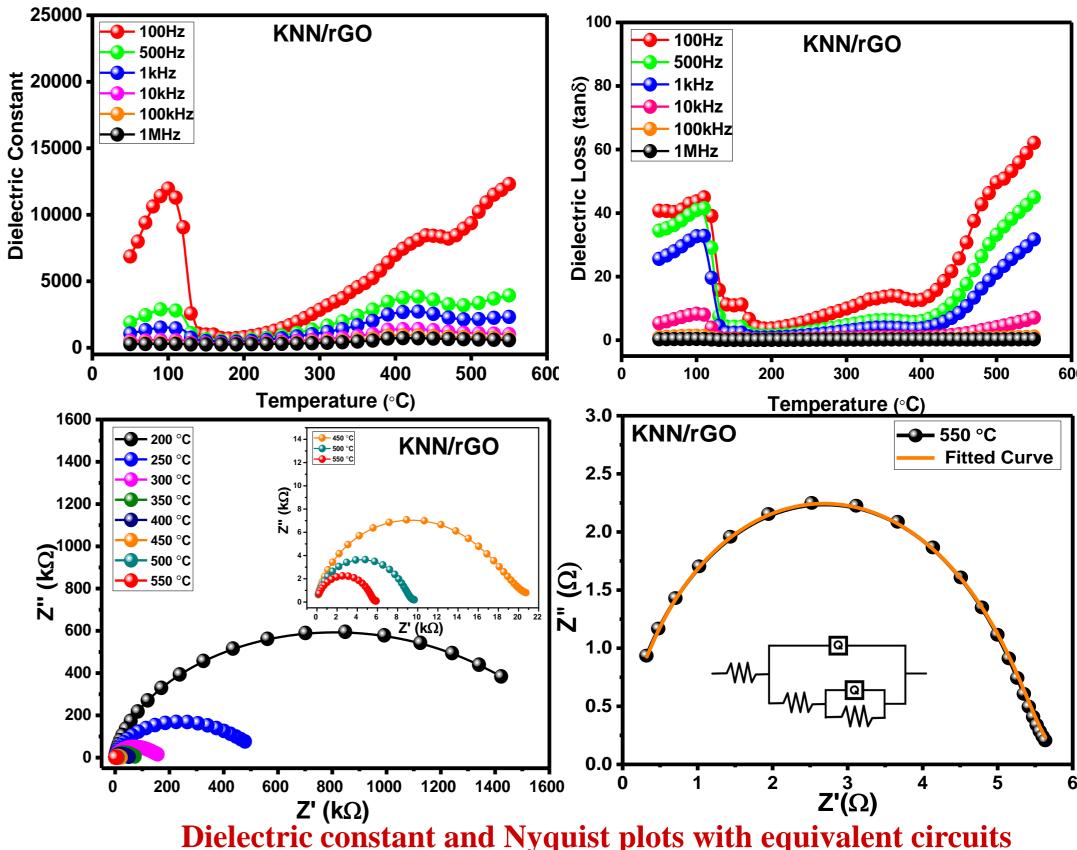
Figure: Schematic representation of preparation of KNN/rGO composite.

of pellets

RESULTS & DISCUSSION 4000 GRANN/rGO JCPDS No. 32-0822 1000 10



Field emission scanning electron microscopy and particle size distribution



CONCLUSION

Novel lead-free KNN/rGO composites were successfully synthesized using solid-state and electrospinning methods. The incorporation of rGO induced a phase transformation from orthorhombic to pseudo-cubic symmetry and reduced crystallite size. Dielectric constant was significantly enhanced, along with improved grain connectivity and reduced resistance. Overall, rGO-modified KNN exhibits superior dielectric properties, making it a promising candidate for advanced lead-free energy storage applications.

FUTURE WORK / REFERENCES

Future work will focus on optimizing the rGO content to achieve an optimal balance between dielectric performance and microstructural stability. Additionally, further studies will be conducted to assess the scalability of the synthesis process and its integration into energy storage devices.

Bairagi, S. and S.W. Ali, *Poly (vinylidine fluoride)(PVDF)/Potassium Sodium Niobate (KNN) nanorods based flexible nanocomposite film: Influence of KNN concentration in the performance of nanogenerator.* Organic Electronics, 2020. 78: p. 105547.