Dielectric and Transport Behavior of Dual Doping (Sm-Ce) in $Bi_2Ca_2CoO_6$ Perovskite Cobaltite

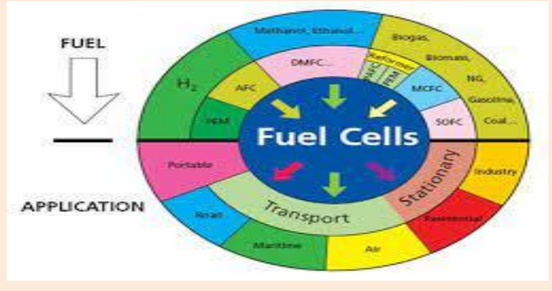
Yasir Abbas, M. Kamran, M. Anis-ur-Rehman
Applied Thermal Physics Laboratory (ATPL), Department of Physics,
COMSATS University Islamabad, 45550, Islamabad, Pakistan

Abstract

- $Bi_2Ca_{1.80}Sm_{0.10}Ce_{0.10}CoO_6$ (BCSCCO) perovskite were synthesized the using co-precipitation route
- XRD analysis confirms the monoclinic structure with space group P21/m
- The obtained results are validated using the Jonscher power law.

Introduction

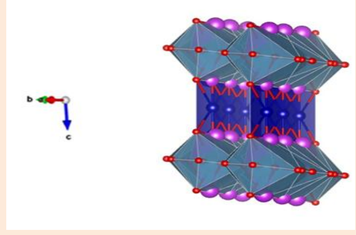
- Fossil fuels are the major sources of our energy production in current era, which are limited by nature. Geologists are expecting the current reserves to last up-to 2042 [1].



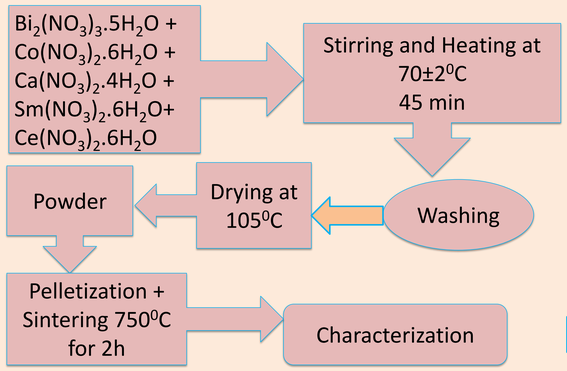
Crystal Structure

$Bi_2Ca_2CoO_6$

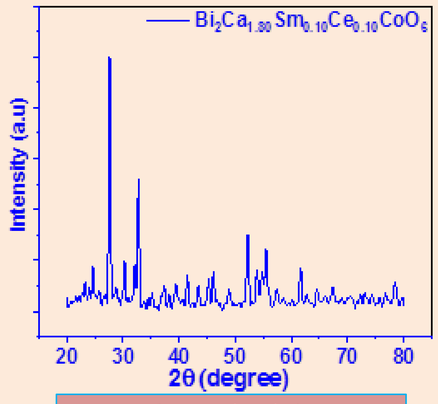
Crystal System



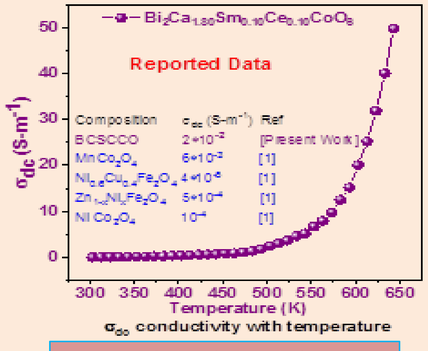
Synthesis Route



Results



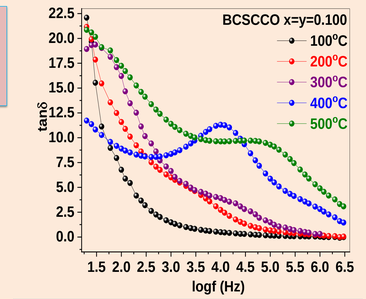
Structural analysis



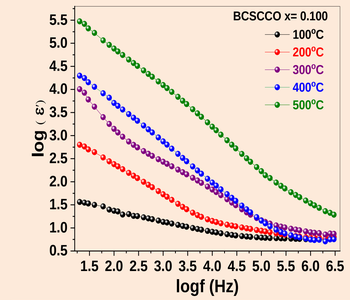
DC electrical analysis

Acknowledgement

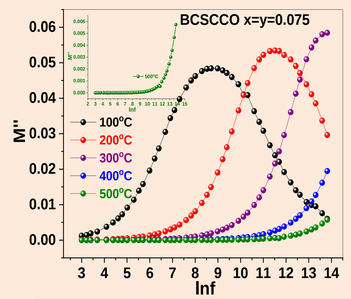
Results



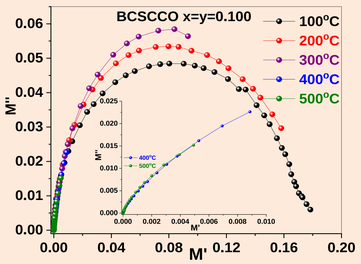
Loss Tangent with temperature



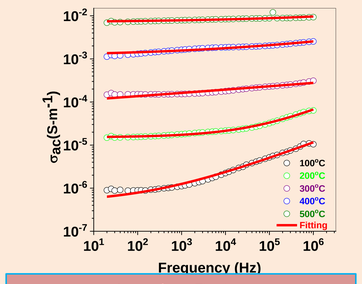
Dielectric Constant



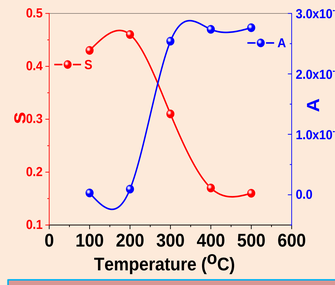
Imaginary part of modulus



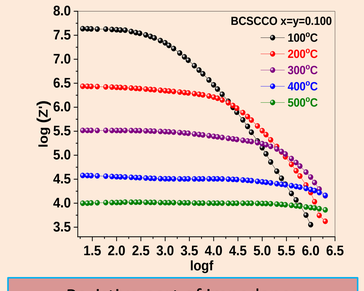
Modulus Spectroscopy



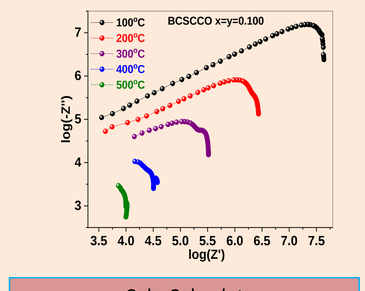
Jonscher Fitting



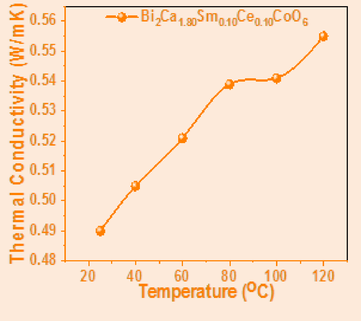
Variation of s and A with temperature



Resistive part of impedance



Cole-Cole plot



Thermal conductivity

References

[1] Muraleedharan, S., Thiruvenkatam, V., Karayi, S. O., Karuppiah, K., Jawahar, V., & Ashok, A. M. (2020). Investigation on temperature-dependent electrical properties of $La_{1-x}A_xCoO_3$ (A–La, Li, Mg, Ca, Sr, Ba). CrystEngComm, **22**(1), 85-94

Conclusion

- Synthesis of BCSCCO nanoparticles was done using co-precitation route.
- Jonscher power law is used to investigate the conduction process.
- The prepared sample follow the Correlated barrier hoping conduction mechanism.
- The sample BCSCCO has a higher value of electrical conductivity.
- At 500°C the BCSCCO sample has been depicted with dielectric constant of 3.8×10^6.
- The synthesized sample is suitable for renewable energy applications and energy storage.