# CURRICULUM VITAE

**NAME: Dr. ANIRBAN CHAKRABARTI**

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## 1. PERSONAL PROFILE:

**1.1 Name** : Anirban Chakrabarti

**1.2 Father's name** : Late Asimananda Chakrabarti

**1.3 Date of birth** : 18-10-1990

**1.4 Gender** : Male

**1.5 Category** : General

**1.6 Nationality** : Indian

**1.7 Languages known:** Bengali, English, Hindi

**1.8 Email** : anirbanchakrabarti2@gmail.com

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**1.10 Present address:** Tirupati Apartment, Flat S-II
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P.S. – Netaji Nagar; P.O: Naktala
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PIN- 700047, Kolkata, India

**1.11 Permanent address:** Tirupati Apartment, Flat S-II
25/B, Baishnabghata Road
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## 2. ACADEMIC DEGREE QUALIFICATIONS:

| Year | Activity | Specialization | Institution | %age/ CGPA | Division /Class |
|---|---|---|---|---|---|
| 2007 | Secondary Examination | NA | South Point High School | 81 | I |
| 2009 | Higher Secondary | Science | South Point High School | 66.6 | I |
| 2012 | Undergraduate (B.Sc Honors) | Chemistry | University of Calcutta | 61 | I |
| 2014 | Postgraduate (M.Sc) | Chemistry | IIT (ISM) Dhanbad | 7.45 | I |
| 2021 | Ph.D. | Science | Jadavpur University | - | I |

## 3. WORK EXPERIENCE

### Doctoral Training (1st July 2016 -30th June 2021)

**Thesis title:** FERROELECTRIC GLASS-CERAMICS: SYNTHESIS, CRYSTALLIZATION KINETICS AND EVALUATION OF PROPERTIES FOR EXPLORING THEIR APPLICATION POTENTIAL

**Institution:** CSIR-Central Glass and Ceramic Research Institute (Jadavpur University)

**Year of Award:** **2021**


**Abstract of Ph.D. thesis:**

Ferroelectric materials are an important class of materials with a wide range of commercial and industrial applications. Since the discovery of ferroelectricity in the year 1920, many ferroelectric materials have been discovered by modeling the ferroelectric phase transitions and research activity has rapidly increased. There are now more than 1000 oxide and non-oxide ferroelectric materials with extensive applications in the field of electronic industry. The structural anisotropy in ferroelectric crystals has led to extensive application of these crystals as ceramic/polymer/single crystals ranging from high dielectric permittivity capacitors to developments in piezoelectric transducers, pyroelectric sensors, medical diagnostic transducers, electro-optical devices, etc. The global demand for improvement of energy efficiency and development of new green energy sources has attracted the attention for design and development of lead free ferroelectric materials for efficient storage and supply of electrical energy. Also new materials are needed that can exploit light for performing existing functions more efficiently and for creating new devices. In this regard lead free ferroelectric glass-ceramics (GCs) can be a suitable material for such multifunctional applications in electronics and photonics industry. Fabrication of ferroelectric GCs, using the melt quenching followed by heat-treatment is a popular technique to obtain pore-free, fine-grained, nano/ microstructured material, embedded in a low permittivity, high resistivity host glass matrix. With this method, strict control over the crystallite size is possible and transparent characteristics of the host glass can be retained. The properties of the GCs can be tailored by varying the volume fraction of the crystal phase dispersed in the glass matrix through optimization of the composition and heat-treatment protocols. In order to achieve the requirement for photonic as well as electrical applications, a balance between the average crystallite size and volume fraction of the active

ferroelectric phase is primary. High volume fraction of the phase shall lead to higher crystallite size and increased Rayleigh scattering in the GCs due to which transparency cannot be achieved for optical and photonic applications. On the other hand, a high volume fraction and particle size of the ferroelectric phase is necessary so that the threshold ferroelectric domain size can be achieved for notable hysteresis due to polarization switching. Hence synthesis of ferroelectric GCs with controlled crystallization for optical and electrical applications remains a challenging topic for research.

For the first time, under this dissertation work, novel bi-layered bismuth layer structured ferroelectrics (BLSFs) like $BaBi_2Ta_2O_9$ (BBT), $CaBi_2Ta_2O_9$ (CBT) and $BaBi_2Nb_2O_9$ (BBN) and $Eu_2O_3$ doped fresnoite based $Ba_2TiGe_2O_8$ (BTG) have been successfully synthesized in the glass-ceramic route by the melt-quenching technique. The crystallization kinetic studies of the base glasses were performed with the thermal data obtained from non-isothermal differential scanning calorimetry (DSC) studies. The crystallization kinetic study enabled us to determine the rate of crystallization at different temperatures, which facilitated us to choose an optimum temperature where crystallization can be precisely controlled. Such controlled crystallization lead to achieving transparency in some of the ferroelectric GCs heat-treated for optimum duration. The phase analysis, microstructure, optical, dielectric and ferroelectric properties of the GCs were evaluated and analyzed for all the above systems.

## Other Work Experiences

- ***May2013 – June2013*: Department of Chemistry, Indian Institute of Technology (IIT), Kharagpur, India**

  M.Sc Summer Project Intern

  **Project title:** Computational Studies on Hauser Annulation Reactions

- ***August 2013 – May 2014*: Department of Chemistry, IIT (ISM) Dhanbad, India**

  M.Sc Research Project

  **Project title:** Synthesis and Characterization of Transition Metal Complexes using Amino-Functionalized P(V) Ligand.

- ***July 2014 –February 2015*: Research Scholar, Department of Chemistry, IIT Hyderabad, India**
- ***12$^{th}$ Dec – 16$^{th}$ Dec, 2014***: Indian Institute of Science Education and Research (IISER), Pune Workshop on "Introduction to Gaussian: Theory and Practice"

- ***4$^{th}$ Nov 2019 – 8$^{th}$ Nov 2019*: Department of Materials Science and Engineering, IIT Kanpur, India**

  Short Term Training Course

  **Course title:** Electroceramics For Energy Application

## 4. Professional Recognition/Award/Prize/Certificate

- Qualified the Joint Admission Test for M.Sc. 2012 by Indian Institutes of Technology (IIT) with All India Rank – 293
- Qualified the All India Examination for M.Sc. 2012 conducted by the Indian School of Mines (ISM) (presently IIT) Dhanbad.
- Qualified Joint CSIR-UGC National Eligibility Test (NET) in Chemical Science (Chemistry) held in December 2015, with All India Rank 32 in UGC-JRF category.
- Awarded with UGC-JRF (effective from July 2016) to carry out research work in India.
- Awarded with UGC-SRF (effective from July 2018) to carry out research work in India.
- Qualified Graduate Aptitude Test in Engineering (**GATE**) for Chemistry held on January, 2014 and 2016 and secured All India Rank-571.
- Received First Prize for presenting the Project entitiled, "*In spite of the many advantages glass has as a solid-state electrolyte in Li batteries, no breakthrough for practical applications has been seen. Identify its limitations and design glass composition(s) to overcome those limitations*", 2nd ICG-CGCRI Tutorial (through virtual mode) January 18-27, 2021, CSIR-CGCRI, Kolkata, India.

## 5. Publications in SCI journals

| | |
|---|---|
| No of publications as first author | 6 |
| No of publications as co-author | 2 |
| Total = | 8 |
| Highest Impact Factor | **5.316** |
| Average Impact Factor | **4.525** |

1. **Anirban Chakrabarti**, Atiar Rahaman Molla, Zirconia assisted crystallization of ferroelectric $BaBi_2Nb_2O_9$ based glass-ceramics: Kinetics, optical and dielectrical properties, ***J. Alloys Compd.*** 844 (2020) 156181. (*I.F: 5.316*)

2. **Anirban Chakrabarti**, Atiar Rahaman Molla, $BaBi_2Ta_2O_9$ based glass-ceramics: Influence of $ZrO_2$ on crystallization kinetics, microstructure and dielectric properties, ***J. Alloys Compd.*** 805 (2019) 247-257. (*I.F: 5.316*)

3. **Anirban Chakrabarti**, Atiar Rahaman Molla, Synthesis of $Eu_2O_3$ doped $BaO\text{-}TiO_2\text{-}GeO_2$ based glass-ceramics: Crystallization kinetics, optical and electrical properties, ***J. Non-Cryst. Solids*** 505 (2019) 354-366. (*I.F: 3.531*)

4. Anil Kumar, **Anirban Chakrabarti**, Manoj. S. Shekhawat, Atiar Rahaman Molla, Transparent ultra-low expansion lithium aluminosilicate glass-ceramics: Crystallization kinetics, structural and optical properties, ***Thermochim Acta*** 676 (2019) 155-163. (*I.F: 3.115*)

5. Rishideo Kumar, Atiar Rahaman Molla, **Anirban Chakrabarti** and Anal Tarafder, $Eu^{3+}$-doped transparent potassium lanthanum silicate ($KLaSiO_4$) glass-ceramic nanocomposites: Synthesis, properties and applications, ***J. Eur. Ceram. Soc.*** 38 (2018) 2639-2648. (*I.F: 5.302*)

6. **Anirban Chakrabarti**, Atiar Rahaman Molla, $Eu^{3+}$-doped ferroelectric $CaBi_2Ta_2O_9$ based glass-ceramic nanocomposites: Crystallization kinetics, optical and dielectric properties, ***Ceram. Int.*** 44 (2018) 7557-7568. (*I.F: 4.527*)

7. **Anirban Chakrabarti**, Kaushik Biswas and Atiar Rahaman Molla, $Eu^{3+}$-doped ferroelectric $BaBi_2Ta_2O_9$ based glass-ceramic nanocomposites: Crystallization kinetics and energy storage properties, ***J. Alloys Compd.*** 740 (2018) 237-249. (*I.F: 5.316*)

8. **Anirban Chakrabarti**, Anal Tarafder and Atiar Rahaman Molla, Synthesis of $Eu^{3+}$-doped $BaBi_2Ta_2O_9$ based glass-ceramic nanocomposites: Optical and dielectric properties, ***J. Am. Ceram. Soc.*** 101 (2018) 231-243. (*I.F: 3.784*)

**Conferences and seminars:**

1. **Anirban Chakrabarti**, Anal Tarafder and Atiar Rahaman Molla, Synthesis and Characterization of $Eu^{3+}$ doped ferroelectric $BaBi_2Ta_2O_9$ based glass-ceramic nanocomposites, **International Conference on Advancement in Glass Science and Technology (ICAGST- 2017)**, January 23- 25 held at CSIR-CGCRI, Kolkata.

2. **Anirban Chakrabarti**, Anal Tarafder, Kaushik Biswas and Atiar Rahaman Molla**, Innovations in Glass and Glass Technologies: Contributions to a Sustainable Society; Annual meeting of the International Commission on Glass (ICG)**, Sept 23 -26, 2018, Japan.

3. **Anirban Chakrabarti**, Atiar Rahaman Molla, Determination of novel heat-treatment protocol through crystallization kinetics studies to synthesize transparent $CaBi_2Ta_2O_9$ based ferroelectric glass-ceramics, **2nd International Conference on Nano Science and Engineering Applications (ICONSEA-2018)**, JNTU, Hyderabad.

4. **Anirban Chakrabarti**, Atiar Rahaman Molla, Transparent ferroelectric glass-ceramics: Synthesis, properties and applications, National Seminar on **"Propelling Innovations in Glass and Ceramics for Atmanirbhar Bharat"**, Indian Ceramic Society, Kolkata Chapter, CSIR-CGCRI, December, 2020.

## 6. Detail of patents: **Nothing to declare**

## 7. Book Chapter(s):

**Anirban Chakrabarti**, Sreedevi Menon, Anal Tarafder, Atiar Rahaman Molla, **Glass-ceramics: A Potential Material for Energy Storage and Photonic Applications: Glasses and Glass- ceramics: Advanced Processing and Applications.** Springer Nature (2021) (*Under review*).

## 8. Link to research websites:

1. https://scholar.google.com/citations?user=ZCBkOcYAAAAJ&hl=en
2. https://publons.com/researcher/3760177/anirban-chakrabarti/
3. https://www.researchgate.net/profile/Anirban-Chakrabarti-4

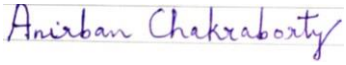
## 9. Experimental and technical skills

- **Sample Preparation techniques:**
    1. Synthesis of glass systems using high temperatures glass melting furnaces and glass annealing furnaces
    2. Synthesis of glass-ceramics with controlled crystallization using proper heat-treatment protocols
- **Characterization techniques and technical skills:**
    - ✓ Operating high temperature raising hearth furnace and chamber furnaces
    - ✓ Hands-on experience in operating the differential scanning calorimeter (DSC), Dilatometer, UV-Vis-NIR spectrophotometer, IR spectrometer, LCR meter, Prism Coupler
    - ✓ Data interpretation and analysis of DSC, UV-Vis, IR, LCR meter, Hysteresis loop analyzer, XRD, TEM, FESEM, XRF, Fluorimeter, Microhardness tester and Prism Coupler
    - ✓ Microsoft Office and origin (version 6, 8, 8.5 and 9)
    - ✓ Chem Draw, Gaussian 09
    - ✓ Netzsch Thermokinetics Proteus Software

## 10. DECLARATION

I hereby declare that all the above information is true to best of my knowledge.

**Date:** 1st October, 2021



(Anirban Chakrabarti)