



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : GAJENDRA SINGH BISHT  
Roll Number : 176121101  
Programme of Study : Ph.D.  
Thesis Title: Magnetic and Structural Properties of Pseudo-1D Substituted Compounds of  $\text{Ca}_3\text{Co}_2\text{O}_6$   
Name of Thesis Supervisor(s) : Prof. DILIP PAL  
Thesis Submitted to the Department/ Center : PHYSICS  
Date of completion of Thesis Viva-Voce Exam : 07/12/2023  
Key words for description of Thesis Work : Pseudo-1D spin-chain compounds, Cluster-glass, Frustrated materials, and Thermal memory cell

---

**SHORT ABSTRACT**

This thesis is focussed on the different aspects of magnetism and magnetic frustration arising due to magnetic and non-magnetic dopants in the spin structure, glassy behavior, and low dimensional characteristics of the system by a combined discussion on the structural features, static magnetic properties, dynamic magnetic behavior, and first-principles study. We also highlight the technological importance of the magnetically frustrated low-dimensional system in the thermal memory cell. We found evidence of Cluster-Glass-like freezing phenomena in these system which makes the system different from conventional spin-glass, and concluded that the glassy state to be formed from cluster of spins rather than a single spin. The cyclic temperature experiments have been performed to demonstrate the recurrence in the multilevel of the relaxed magnetization path, which was not noticed earlier. The exquisite reproducibility of relaxed magnetization as a function of temperature under a non-equilibrium phase makes such a phenomenon unique, which is easily recoverable with temperature cycling.