Title: **Study of Dielectric Relaxation and Non-Ohmic Behaviour in Amorphous semiconductors**

Name of the candidate: **Mohsin Ahmed Ganaie**

Name of the Supervisor: **Prof. M. Zulfequar**

Department: **Physics**

ABSTARCT

Amorphous semiconductor play a key role in search for novel functional materials with excellent optical and electrical properties.These alloys draw a lot of attention, and various efforts has been made to tune its applications for future prospects in various field of electronic and optoelectronic devices. The chalcogenides in their glassy states become more flexible, and their property can be modified by inducing many external effects such as light, other radiations, field, particle, heat, pressure etc. These materials are highly non-linear, having low phonon energy and are transparent in IR region which make it useful candidate for all optical switching. The optical properties of chalcogenide semiconductors changes when induced by light of appropriate energy and intensity. The properties include photoconductivity, photovoltaic, photoluminescence, and non-linear optical phenomena that are connected with purely electronic effects, furthermore photo-induced modifications which includes local expansion or contraction, modification of refractive index, change in density, hardness, chemical reactivity, optical properties as well as decomposition and crystallization has been observed.

The field applied to the surface of the material is a powerful technique for the determination of density of states in chalcogenide semiconductors which is closely connected to the charge transport, conduction and trapping/de-trapping in these materials. At low fields a

linear current-voltage relation has observed, but at high voltage, current become non-ohmic, that means, current increases faster with voltage. If insulating films having proper electrodes contacts, initial amount of charge carriers are quite small, but more free charge carriers can be injected from the electrodes under high electric field leadings to the large amount of charge carrier within the insulating thin films. Various conduction mechanisms occur at high field such as, electrode-controlled mechanisms or bulk-controlled mechanisms. The first category include the Fowler–Nordheim injection and Schottky injection, while second category comprise, hopping conduction, field limited space-charge conduction, and space-charge-limited conduction (SCLC). Here in our case SCLC is found to be appropriate model and which can be used for the determination of density of states in the localized states.

Also the dielectric properties of these materials is important because it give atomic structure information and useful in developing technological importance. The dielectric study of a-semiconductor reveals that dielectric dispersion exist at low frequency and high temperature. Amorphous semiconductors as the name implies shows high electrical resistance and they are used as a dielectric materials. In integrated circuit (IC) dielectric materials are used as insulating layers to isolate electrical conduction from one another, diffusion and ion implantation masks, capping material, passivation layers to protect devices from impurities, exploratory RC circuit application. Resents progress in the communication technology requires the materials with unusual combination of properties like high dielectric constant, loss losses and low temperature dependent dielectric properties. These properties are used as a base materials for resonators and filterers for the microwaves carrying the desired information.