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Abstract:	In the previous decade, nanoscience has been a fast changing and expanding discipline. This contains recent work as well as more advanced concepts. Three key fields of nanoscience and nanotechnology include nanomaterials, nanodevices, and nanomeasurement and nanochar- acterization. As systems scale down to the nanoscale scale and new nanodevices arise, pre- cise characterization and thorough understanding of their electrical structure become more vital but more difficult. Capacitance can now be measured precisely thanks to technological improvements over the years. However, as the miniaturization of electromechanical devices pushes measuring techniques to their limits, there is a need to enhance the measurement of small capacitance changes. Current Metal insulator metal (MIM) capacitors technology utilises low dielectric constant (k) materials (k 3.9 - 7), however, these materials achieve the required electrical properties of high electric field breakdown strength and minimal leakage current. The low k value of the current materials presents a substantial risk to the future development of many tech- nologies and the integration of high-k materials in MIM capacitor structures has become absolutely vital to achieve scaling needs. Since Aluminium Oxide Phosphate (AlPO) is ma- terial of high intrinsic charge trap and low leakage current, so in this work we investigate the electrical properties of a aluminium oxide phosphate material system in MIM capacitors. In explicit terms, we have designed a set-up for high precision capacitance measurements at low temperatures and high magnetic fields. In the first chapter, we talk about current ca- pacitance measurement devices used and about the AlPO dielectric. In the second chapter, we discuss some key concepts of making and working principles of capacitance measuring instruments, and moving on in the third chapter we have described the experimental set-up and discussed thoroughly all the components used and fabricated. And in the final chapter talks about the progress we have made so far in fabricating the components, results so far, and future work.
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