also studied in detail.

The thesis opens with an account of a new derivation of a relationship between the magnetic charge of a dyon and the topology of the gauge fields associated with it. Although this formula has been reported earlier in the literature, the present method has two distinct advantages. In the first place, it does not depend either on the mechanism of symmetry breaking or on the nature of the residual symmetry group. Secondly, the results can be generalised to finite temperature monopoles.

We have carried out a systematic search for solutions of the nonlinear radial field equations of the 't Hooft-Polyakov monopole theory by using the direct method of Hirota. We have applied this method to the second order non-linear differential equations corresponding to a vanishing Higgs self-interaction and reproduced all the previously known solutions which satisfy the first order Bogomolny equations.

A pair of exact, complex conjugate solutions is constructed for SU(2) gauge theory in the Prasad-Sommerfield limit. The Euclidean actions corresponding to these solutions are found to be finite and complex. These flat-space solutions are transformed to de Sitter space by a standard procedure.

We have constructed new time-dependent solutions to pure SU(2) gauge theory which are related to monopoles and dyons. Another set of solutions, which approaches a singular dyon configuration are also obtained. All the solutions are regular at the origin and hence the corresponding actions are finite. In both cases, owing to the infiniteness of action, semiclassical approximation cannot be directly applied to extract more physical content. However, their Euclidean time development is interesting.

In the final section of the thesis we carry out a study of the bound states of spin 1/2 and spin zero particles in the background field of a point dyon for isospinor and isovector representations. Energy levels and eigen-functions for all angular momenta are obtained for isospinor fermions, isospinor bosons and isovector bosons. For isovector fermions bound state spectrum for lowest angular momentum is determined. The method of separation of angular and radial parts is achieved by using spherical harmonics. This method is compared with an alternative method of separation using monopole harmonics, and the two methods are shown to be equivalent. A relation connecting monopole harmonics and spherical harmonics is also derived. The study of the bound states of monopoles and dyons is important for their possible experimental detection.


In this thesis is reported the preparation and characterization of Bi₂Te₃ films. The bismuth and tellurium flux are approximately 2-3 × 10¹⁶ atoms cm⁻²s⁻¹ and 3-4 × 10¹⁵ atoms cm⁻²s⁻¹ respectively. The substrate temperature is in the range 530-545 K. X-ray diffraction studies have shown that these films have no particular orientation on the substrate surface. Electrical measurements show that the films have carrier concentration of 1.2 × 10¹⁵ electrons cm⁻³ and a mobility of 100 cm²/V s⁻¹. Thermoelectric power measurements show that these films have a high thermoelectric power of 350 V K⁻¹.

A systematic study of the oxidation of thin films at high temperature has been performed. The temperature of oxidation was varied in the range 530-545 K. Films of Bi₂O₃ obtained by three techniques have been obtained using activated reagents and X-ray diffraction studies it is seen that the film is amorphous. The films obtained have been confirmed by heat mirrors using layers of Bi₂O₃, transmission and IR reflection have been used to identify Bi₂O₃ and gold layers. These structures are transformed to de Sitter space by a standard procedure. Heat mirrors using layers of Bi₂O₃, transmission and IR reflection have been used to identify Bi₂O₃ and gold layers. These structures it will increase the efficiency and in glass it will give better insulation.

S.p.32. JAYALEKSHMI, S.-An Investigation of Electrical and Optical Properties of Certain Polymer Films and Evaporated V₂O₅ Films-1987-Dr. C. Pradeep.

The work presented in the thesis consists of a systematic study of the oxidation of thin films at high temperature. Plasma polymerization has been used to prepare thin films of Bi₂O₃ from a mixture of bismuth and tellurium. The films obtained have been confirmed by heat mirrors using layers of Bi₂O₃, transmission and IR reflection have been used to identify Bi₂O₃ and gold layers. These structures it will increase the efficiency and in glass it will give better insulation.

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A systematic study of the oxidation of bismuth films in different atmospheres like air, super-heated steam, nitrogen, and partial vacuum has been undertaken. The temperature of oxidation is varied from 500 K to 650 K. X-ray diffraction studies have been made of the different films prepared and the different single phase films of Bi\textsubscript{2}O\textsubscript{3} (tetragonal), Bi\textsubscript{2}O\textsubscript{3} (monoclinic), and V\textsubscript{2}O\textsubscript{3} (cubic) obtained have been confirmed.

Three temperature method was also used here for the preparation of Bi\textsubscript{2}O\textsubscript{3} films. Here bismuth is evaporated into an oxygen atmosphere. The impingement rate of bismuth atoms into the substrate surface is varied from 3.5 \times 10^{10} to 5.6 \times 10^{10} atoms cm\textsuperscript{-2} s\textsuperscript{-1}. The substrate temperature is also varied from room temperature to higher temperatures. Only B-phase films are obtained by this technique.

Films of Bi\textsubscript{2}O\textsubscript{3} obtained by three temperature method is of poor quality due to the incorporation of unreacted bismuth in the growing films. Good quality films have been obtained using activated reactive evaporation. As evidence by the x-ray diffraction studies it is seen that at constant oxygen pressure, for low bismuth evaporation rate, Bi\textsubscript{2}O\textsubscript{3} and at high evaporation rate, V\textsubscript{2}O\textsubscript{3} are obtained. Refractive index, absorption coefficient, and band gap of these films have been determined from the study of optical properties.

Heat mirrors using layers of Bi\textsubscript{2}O\textsubscript{3} and gold has been fabricated. Visible transmission and IR reflection have been optimized by varying the thickness of Bi\textsubscript{2}O\textsubscript{3} and gold layers. These structures can be used incandescent lamps, where it will increase the efficiency and in glass panes and windows of buildings where it will give better insulation.


The work presented in the thesis comprises of the preparation and properties of certain plasma polymerized thin films and electron beam gun evaporated V\textsubscript{2}O\textsubscript{3} thin films. Plasma polymerization has been carried out both in R.F. and D.C. glow discharges. In the R.F. plasma monomer Citral was polymerized and the electrical and dielectric properties were investigated. A D.C. discharge plasma was employed to polymerize thiophene. With the intention of comparing the polymer dielectric film with an oxid dielectric film, V\textsubscript{2}O\textsubscript{3} thin films were prepared by electron beam gun evaporation method and their dielectric properties investigated.

The films obtained by polymerizing Citral in the R.F. plasma, showed exceptionally high voltage stability and excellent thermal and chemical stability. A 5000A thick polymer film was found to withstand more than 1000 volts without any sign of breakdown. For polyacril films the electrical conductivity, dielectric loss, temperature coefficient of dielectric constant and percentage variation of dielectric constant with frequency were also found to be low. The observed dielectric properties were found to be comparable to those of the best known insulators.

These offer the possibilities for applying polyacril thin film as the insulating material in high voltage thin film capacitors. V\textsubscript{2}O\textsubscript{3} thin films were prepared by the electron beam gun evaporation technique. The electrical conductivity and dielectric properties of the films were investigated.

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