WORK DONE REPORT

(Detailing the results obtained and their relevance of the minor research project)

Zirconium oxide finds its applications in use in ceramic stains for coloured glazed tiles ,high temperature refractory materials and in glass polishing .It is also used in alkali resistant glasses ,electrochemical industries, corrosion resistant materials and as opacifier . Moreover ,Zirconium oxide is a high index ,low absorption material usable for coating in the near UV to IR regions . Dense layers with exceptional hardness can be deposited with electron beam evaporation or sputtering .Typical applications include near UV laser and dielectric mirror designs. Zirconia can be used in combination with silicon dioxide layers to form high index –contrast multilayer structures .In the investigations we could develop a wet method to obtain high quality thin films of Zirconium dioxide by relatively simple method . The method involves precipitating Zirconium oxichloride with ammonia solution with the glass substrates dipped in the bath .The reaction time is optimized so that Zirconium hydroxide is retained onto glass substrates .In order to remove the Cl ions the deposited film is washed with distilled water .Then by oxidizing ,the hydroxide ZrO2 is formed The structural characterization of ZrO2 is done by XRD and slow scan of the same is used to find out the grain size . For this purpose Scherrer formula is used .The formula is $D=0.9\lambda/\beta\cos\Theta$ Where D is grain size . β is full width half maximum and Θ is diffraction angle and λ is wavelength of X –rays . The structure shows polycrystalline nature .The optical characterizations are used to determine the refractive index n" and extinction coefficient "k" . Because the index below wavelength 300 nm is near 2 ,zirconia can be combined in multilayers with silicon dioxide (n=1.48) for UV laser applications. Hard , scratch free and adherent coatings can be deposited on low temperature substrates. Its abrasion resistance provides protection of metal mirrors.

There is renewed interest in the investigations regarding Photo electrochemical behavior of ZrS thin films due to appropriate band gap required for solar to electrical energy conversion.The Zirconium hydroxide is reacted with sodium thiosulphate at room temperature for obtaining thin films of ZrS by SILAR method The optimization of concentration cycles for deposition on to glass substrates has been carried out . The XRD studies reveal that the ZrS films are nanocrystalline in nature. The post deposition treatment was carried out by vacuum annealing . The PEC effect showed n type conductivity with graphite as cathode after selecting a suitable electrolyte .
