

SOLID STATE PHYSICS

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The Solid State Physics programme of the IFS was initiated in early, 1987, with a project on Semiconductors. Under this project, optical and electrical properties of semiconducting copper-indium diselenide (CuInSe_2) single crystals and thin films electrodeposited on titanium substrates have been investigated. We have observed that electrodeposited films can also be grown successfully on stainless steel substrates, which is less expensive than titanium. Present work concentrates on the possibility of using such films in solid state and photoelectrochemical solar cells.

The superconductivity project was initiated in May, 1987 as a direct follow up of the International Symposium on Solid State Physics held in April, 1987. Under this project, we have successfully prepared the new ceramic oxide type yttrium-barium-copper-oxide ($\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$) superconductors and studied its electrical and magnetic properties. Initial studies were concentrated on understanding the annealing conditions for sample preparation and developing measuring techniques. An effort has been made to understand the mechanism of superconductivity in these materials, by doping them with Al_2O_3 and Fe_2O_3 . Non-percolative nature and pair breaking effect by magnetic impurities appears to result from these additives. Search for new materials with higher superconducting transition temperature and setting up of laboratory facilities for sample preparation and characterization are under way.

Publications

1. AC conductivity of CuInSe_2 - K. Premaratne, S.H.S.P. Samarappuli and M.A.K.L. Dissanayake, Proc. Int. Symposium on Solid State Physics, Kandy, Sri Lanka, (1987) (to be published).

2. Effect of Al_2O_3 and Fe_2O_3 on the superconducting transition temperature of Y-Ba-CuO (in preparation).

Other Activities

Following workshops/symposia have been organised at the IFS:

1. National Workshop on Solid State Physics - One day workshop was held in January 1987: about 30 participants and 5 speakers attended.
2. International Symposium on Solid State Physics was held in April, 1987 sponsored by the International Centre for Theoretical Physics, Trieste, Italy and the Third World Academy of Science, Trieste, Italy. 30 participants and 10 speakers from 9 different countries participated. The idea to initiate a superconductivity project at the IFS emerged as a follow up of this activity.
3. A National Symposium is planned for January, 1988 and an International one for January 1989. Sponsoring agencies and speakers have already been contacted.