Multifunctional Materials Research Centre

in

(Advanced Materials Science & Technology)

Introduction:

Human beings created the stone, bronze and iron ages. Many believe we are in materials age. The area of advanced materials research has very broad scope and potential applications. Advanced materials outperform conventional materials with superior properties such as high electrical, magnetic, optical and mechanical strength. They can have novel properties including the ability to recognise shape or sense changes in the environment and respond. The development of advanced materials can even lead to the design completely new products including medical implants, miniature energy storage devices, display devices, etc. New or improved advanced materials with superior performance for specific applications are nano materials, polymers, super/metallic alloys, ceramic materials, biological materials composites, electronic materials, semiconductors and so on. Different advanced materials have varied applications. Taking into account these aspects, it is proposed to create a Multifunctional Materials Research Centre in Kalasalingam University with following groups.

1. Nano Technology group
2. Biomaterials group
3. Super Ionic Materials group
4. Energy Resource Group
5. Advanced composite group
6. Display Materials group
7. Environmental Research Group
8. Crystallography group.

The above mentioned groups are shown in the figure 1.

Multifunctional Materials Research Centre

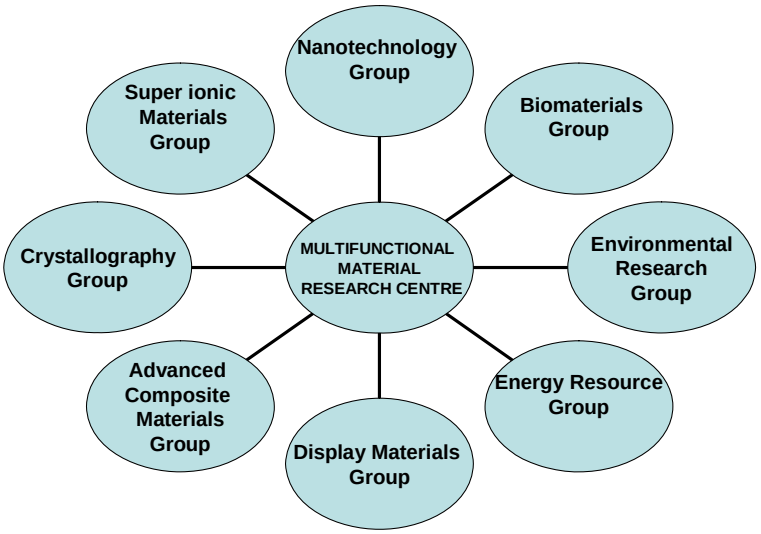


Figure 1. Groups of Multifunctional Materials Research Centre

Nano Technology Group:

This group involves itself in developing nano materials for efficient heat transfer application, lubricants, to reduce automobile gas emission, and aerospace and airline industries. The projects involving above applications are outlined in the detailed project reports.

Biomaterials Group:

Medical applications of advanced materials may be relatively simple such as uses in dentistry or to make better contact lenses or they be as complicated producing a functional and lasting hip replacement. Bio materials implanted into the human body should be able to overcome rejection of biological system. Faculties involved in this group are making plans to develop bone substitute and curcuminiods for curing acute leukemia disease. The projects submitted will throw more information on Biomaterials.

Super Ionic Materials Group:

Every one in daily life uses mobile phones. The mobile phones are powered by lithium rechargeable battery. The usage of mobile phone depends on the power of the battery and its rechargeable capacity. Miniaturization of devices needs lithium rechargeable battery. This group has novel idea of preparing thin film rechargeable battery less than a micron size. Already faculty of the group has got international collaboration to prepare such battery. Polymer membrane fuel cell and super capacitors and oxygen sensors are other devices for which this group develops materials.

Energy Resource Group:

One has to look for various alternative materials for production of energy. Hydrogen could be one of the good sources of energy in future. Dr. S. Karuppuchamy of this group has got training in Kinki University, Japan to develop materials for Hydrogen energy and solar energy. Dr. Vasudevan with his experience in Korea has proposed material for photovoltaic energy resources Details are given in the project.

Advanced Composite Materials Group:

Metal matrix bodies with reinforcements in the form of fibers are expected to give much improved mechanical properties due to the cushioning effect offered by the fiber structures. Aluminum - Boron composite is a good example. Similarly metal composites are also known to exhibit superior mechanical and corrosion resistance properties. In this direction Advanced Composite materials group will be working. Detailed individual projects are appended.

Environmental Research Group:

Due to scientific developments, our living environments should not get spoiled. One has to be very careful in keeping the environment clean. Faculties from this group are aiming at to prepare novel materials for production of pure water free from contamination of any sort and reduce unwanted gas from industry to combat air pollution.

Faculty has got overseas experience in developing these materials. Details are presented in the project.

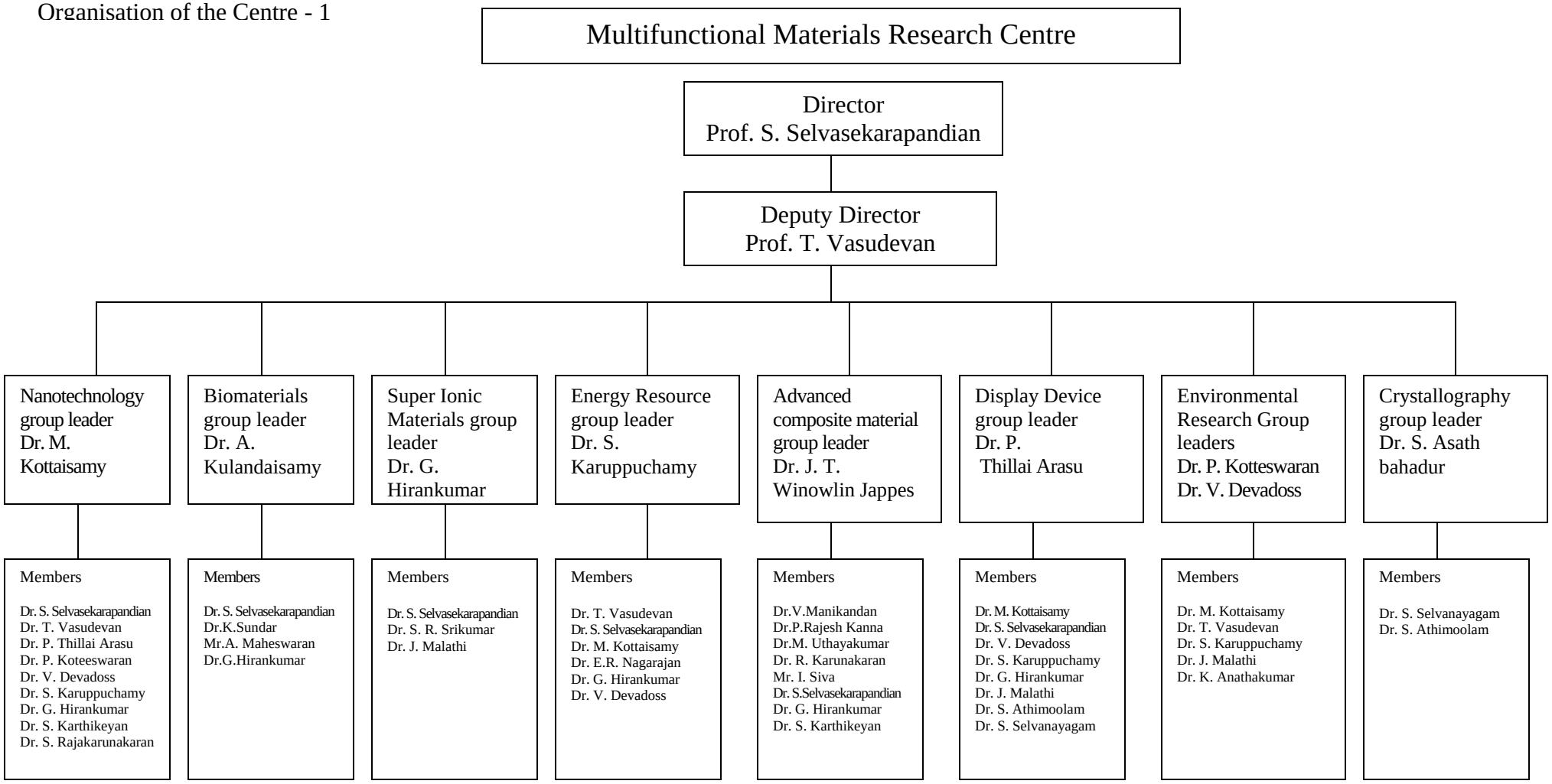
Display Materials Group:

Modern devices have got display screens. The display screens have to be bright even for small applied voltage. This could be possible with efficient phosphor which emit good amount of light. Faculties in this group are concentrating in the development of such phosphor material for high output of light and X-ray image screens.

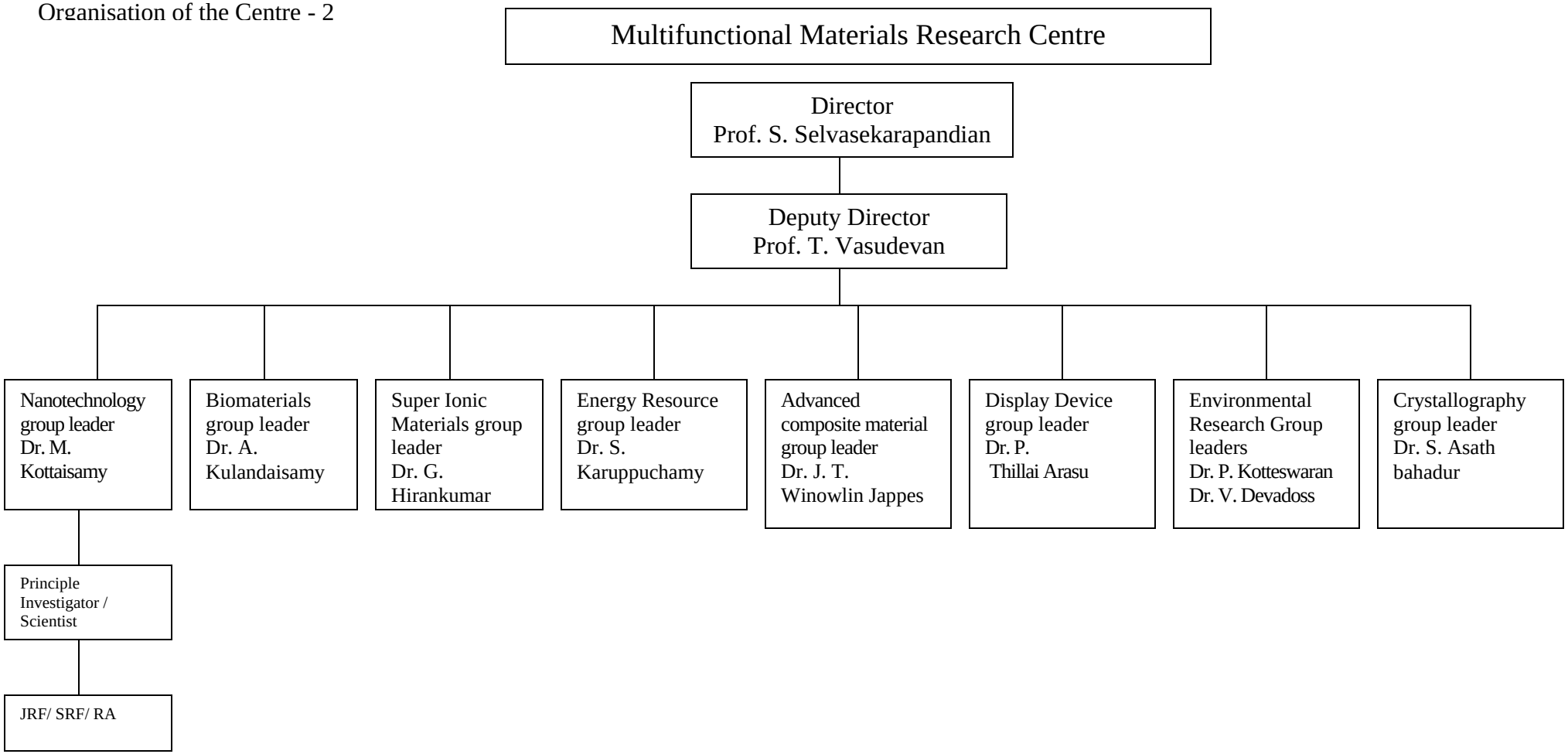
Crystallography group:

Nonlinear optics (NLO) is the branch of optics that describes the behavior of light in *nonlinear media*, that is, media in which the dielectric polarization **P** responds nonlinearly to the electric field **E** of the light. This nonlinearity is typically only observed at very high light intensities such as those provided by pulsed lasers. Nonlinear optics material has applications to generation of light with a doubled frequency, generation of light with a frequency that is the sum of two other frequencies (SHG is a special case of this); generation of light with a tripled frequency. The Crystallography group its developing non linear crystals for various applications as mentioned above.

Organisation of the Centre - 1



Organisation of the Centre - 2



Nanotechnology Group

Faculty

1. **Dr. M. Kottaisamy**
2. **Dr. S. Selvasekarapandian**
3. **Dr. T. Vasudevan**
4. **Dr. P. Thillai Arasu**
5. **Dr. P. Koteeswaran**
6. **Dr. V. Devadoss**
7. **Dr. S. Karuppuchamy**
8. **Dr. G. Hirankumar**
9. **Dr. S. Karthikeyan**
10. **Dr. A. Manohar**
11. **Dr. S. Rajakarunakaran**

Project 1
Title of the Proposal: Development of nano lubricants for tribological applications
Investigators: Dr.M.Kottaisamy, Dr.V.Devadoss, Dr.Ananthakumar, Dr.S.Rajakarunakaran
Total Cost : Rs.53,00,000

Project 2
Title of the proposal: Thermal interface nano-materials (TIM) for efficient heat transfer Applications
Investigator: S. Karthikeyan
Total Cost : Rs. 27,00,000

Project 3
Title of the Proposal: Studies on nano gold decorated cerium oxide- an efficient catalyst for automobile exhaust gas emission
Investigators: Dr. V.Devadoss, M.Kottaisamy and S.Karuppuchamy
Total Cost : Rs. 66,00,000

Project 4
Title of the proposal: Composite Electroless nickel coatings for aerospace and airline industries. **Investigators:**
Investigators: V.Devadoss, M.Kottaisamy, P.Kotteeswaran and T.Vasudevan
Total Cost: Rs.66,00,000

Project 5
Title of the proposal: Tribological Behaviours of Surface Functionalized Molybdenum Sulphide Nanoparticles – A Novel type of Additives in Lubricating Oil
Investigators: Dr. P. Thillai Arasu, Dr. A. Manohar, Dr. S. Rajakarunakaran
Total Cost: Rs. 21,24,000

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 8	15,000 x 10	15,000x10x12x5=90,00,000
Total		2,01,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	53,00,000
Project 2	27,00,000
Project 3	. 66,00,000
Project 4	66,00,000
Project 5	21,24,000
Faculty/ Research Fellow Salary	2,01,00,000
Total	4,34,24,000

Biomaterials Group

Faculty

1. **Dr. A. Kulandaisamy**
2. **Dr. S. Selvasekarapndian**
3. **Dr. K. Sundar**
4. **Mr. A. Maheswaran**
5. **Dr. G. Hirankumar**

Project 1

Project Title: DRUG FOR ACUTE LEUKEMIA DERIVED FROM CURCUMINIOD COMPLEXES
Investigator : Dr.A.Kulandaisamy
Total Cost: Rs. 38,50,000

Project 2

Title of the proposal: Investigation of mechanical interaction and biocompatibility of different phosphate and silicate based bioactive glasses for bone substitute
Invigilators: S. Selvasekarpandian, A. Maheswaran, G. Hirankumar
Total Cost : Rs. 65,44,000

Faculty/Scientists Salary

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF	15,000 x 4	15,000x4x12x5 = 36,00,000
Total		1,47,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	38,50,000
Project 2	65,44,000
Faculty / Research Fellow Salary	1,47,00,000
Total	2,50,94,000

Super Ionic Materials Group

Faculty

1. **Dr. G. Hirankumar**
2. **Dr. S. Selvasekarapandian**
3. **Dr. S. R. Srikumar**
4. **Dr. J. Malathi**

Project 1

Title of the proposal: Development of Advanced nano materials for thin film micro battery & its construction and characterization

Investigators: G.Hirankumar, S. Selvasekarapandian, J. Malathi

Total Cost : Rs. 2,49,80,000

Project 2

Title of the proposal: Room Temperature Oxygen sensor based on Fast Ion Conductor

Investigators: S. Selvasekarapandian, G.Hirankumar, J. Malathi

Total Cost : Rs. 46,50,000

Faculty/Scientists/Research Fellow Salary

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 7	15,000 x 7	15,000x7x12x5 = 63,00,000
Total		1,74,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	2,49,80,000
Project 2	46,50,000
Faculty/ Research Fellow Salary	1,74,00,000
Total	4,70,30,000

Energy Resources Group

Faculty

1. **Dr. S. Karuppuchamy**
2. **Dr. T. Vasudevan**
3. **Dr. S. Selvasekarapandian**
4. **Dr. M. Kottaisamy**
5. **Dr. E. R. Nagarajan**
6. **Dr. G. Hirankumar**
7. **Dr. V. Devadoss**

Project 1

Title: Synthesis and Characterization of Novel Metal Oxide /Carbon Clusters Composite Materials for Hydrogen Energy Applications
Investigators: Dr. S. Karuppuchamy, Dr. T. Vasudevan, Dr. M. Kottaisamy
Total Cost : Rs. 77,00,000

Project 2

Title: Development of Highly efficient dye-sensitized solar cells
Investigators: Dr. S. Karuppuchamy, Dr. M. Kottaisamy, Dr. T. Vasudevan,
Total Cost : Rs.72,50,000

Project 3

Title: Development of polymer photovoltaic cell based on poly(3- alkoxythiophenes) and carbon nanotubes
Investigators: T.Vasudevan, E.R.Nagarajan, V.Devadoss, Karrupasamy, M.Kottaisamy
Total Cost : Rs. 1,00,00,000

Project 4
Title: Development of enzyme based low cost Fuel cell
Investigators: G.Hirankumar, S. Selvasekarapandian
Total Cost: Rs.59,00,000

Budget for Salaries

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 10	15,000 x 10	15,000x10x12x5 = 90,00,000
Total		2,01,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	77,00,000
Project 2	72,50,000
Project 3	1,00,00,000
Project 4	59,00,000
Faculty/ Research Fellow Salary	2,01,00,000
Total	5,09,50,000

Advanced Composite Materials Group

Faculty

1. **Dr. J. T. Winowlin Jappes**
2. **Dr.V.Manikandan**
3. **Dr.P.Rajesh Khanna**
4. **Dr.M.Uthayakumar**
5. **Dr.R.Karunakaran**
6. **Mr.I.Siva**
7. **Dr. S. Selvasekarapandian**
8. **Dr. G. Hirankumar**
9. **Dr. S. Karthikeyan**

Project 1
Title: INVESTIGATION ON MECHANICAL PROPERTIES OF MINERAL FIBER REINFORCED POLYMER COMPOSITES
Investigators: J. T. Winowlin Jappes, Dr.V.Manikandan
Total Cost : Rs. 15,35,000

Project 2
Title: A NOVEL DEPOSITION PROCESS TO ENHANCE THE PERFORMANCE OF ELECTROLESS NI-P/NANO SIC COMPOSITE COATING
Investigators: J. T. Winowlin Jappes, Dr.P.Rajeshkhanna
Total Cost : Rs. 14,05,000

Project 3
Title: Studies on Mechanical Properties of Coir Sheath Reinforced Polymer Composites.
Investigator: J. T. Winowlin Jappes
Total Cost : Rs. 19,57,000

Project 4
Title: An Investigation on effect of Luffa Sheath Reinforced Polymer Composite in Mechanical Properties
Investigators: J. T. Winowlin Jappes, Dr.R.Karunakaran, Mr.I.Siva
Total Cost : Rs. 24,77,000

Project 5
Title: Fabrication and Machining Characteristics of Functionally Graded Aluminum Composite Materials
Investigators: J. T. Winowlin Jappes, Dr.M.Uthayakumar
Total Cost: Rs. 37,15,000

Budget for Salaries

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 8	15,000 x 8	15,000x8x12x5 = 72,00,000
Total		1,83,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	15,35,000
Project 2	14,05,000
Project 3	19,57,000
Project 4	24,77,000
Project 5	37,15,000
Faculty / Research Fellow Salary	1,83,00,000
Total	2,93,89,000

Display Devices Group

Faculty

1. **Dr. P. Thillai Arasu**
2. **Dr. S. Selvasekarapandian**
3. **Dr. M. Kottaisamy**
4. **Dr. V. Devadoss**
5. **Dr. S. Karuppuchamy**
6. **Dr. J. Malathi**
7. **Dr. G. Hirankumar**
8. **Dr. S. Athimoolam**
9. **Dr. S. Selvanayagam**

Project 1

Title: Development of phosphor materials for phosphor converted white LEDs for energy saving solid state lighting applications
Investigators: Dr.M.Kottaisamy, Dr.V. Devadoss and Dr.S.Karuppuchamy
Total Cost : Rs. 84,00,000

Project 2

Title: Development of Image phosphor materials
Investigators: Dr. S. Selvasekarapandian, J. Malathi, G. Hirankumar, S. Athimoolam
Total Cost : Rs. 79,00,000

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 5	15,000 x 5	15,000x5x12x5 = 45,00,000
Total		1,56,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	84,00,000
Project 2	79,00,000
Faculty/ Research Fellow Salary	1,56,00,000
Total	3,19,00,000

Environmental Research Group

Faculty

1. **Dr. P. Kotteswaran**
2. **Dr. V. Devadoss**
3. **Dr. M. Kottaisamy**
4. **Dr. T. Vasudevan**
5. **Dr. S. Karuppuchamy**
6. **Dr. J. Malathi**
7. **Dr. K. Anathakumar**

Project 1
Topic*:* Design and development of Nano silver coated TiO_2 and Al_2O_3 for water and environmental cleaning applications
Investigators :M.Kottaisamy, V.Devadoss and T.Vasudevan
Total Cost : Rs. 33,00,000

Project 2
Title: Studies on the development of amorphous/crystalline TiO_2 layers for clean environmental applications
Investigators: Dr. S. Karuppuchamy, Dr.V. Devadoss, Dr. M. Kottaisamy
Total Cost : Rs. 48,00,000

Project 3
Topic*:* DESULFURISATION OF FLUE GAS USING Ce^{3+}/Ce^{4+} REDOX MEDIATORS
Investigators: Dr. V.Devadoss, Dr. P.Kotteswaran, M.Kottaisamy, and T.Vasudevan
Total Cost : Rs. 1,13,00,000

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 6	15,000x6	15,000x6x12x5 = 54,00,000
Total		1,65,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	33,00,000
Project 2	48,00,000
Project 3	1,13,00,000
Faculty/Research Fellow Salary	1,65,00,000
Total	3,59,00,000

Crystallography Group

Faculty

1. **Dr. S. Asath Bahadur**
2. **Dr. S. Selvanayagam**
3. **Dr. S. Athimoolam**

Project 1

Title: Development of Non-Linear Optical Materials

Investigators: Dr. Asad Bahadur, Dr. S. Selvanayagam, Dr. S. Athimoolam

Total Cost : 3,12,50,000

Faculty/Scientists

Faculty	Salary /month (in Rs.)	Total salary for 5 years (in Rs.)
Professor	75,000	75,000x12x5 = 45,00,000
Assistant Professor	50,000	50,000x12x5 = 30,00,000
Lecturer x 2	30,000 x 2	30,000x2x12x5 = 36,00,000
JRF x 7	15,000 x 7	15,000x7x12x5 = 63,00,000
Total		1,74,00,000

Total Budget:

Head	Amount (in Rs.)
Project 1	3,12,50,000
Faculty/ Research Fellow Salary	1,74,00,000
Total	4,86,50,000