7.4.4 University as a body support government in clean energy and energy-efficient technology policy development

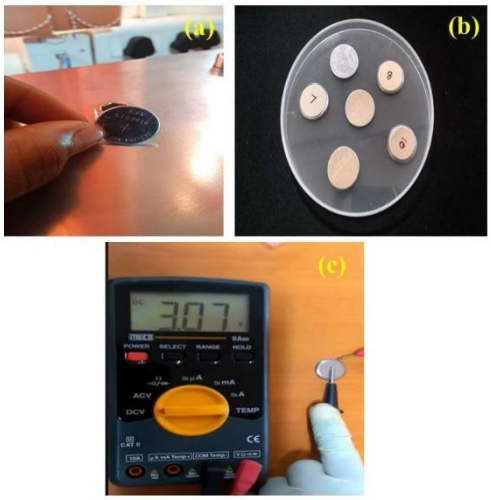
KITS is involved in research with funding from Govt Agencies towards clean energy energy efficient technologies. The outcome of the research is presented in significant conferences and published in indexed Journals and appropriate recommendations are communicated to the Government as a support to ensure clean energy and energy-efficient technology policy development. One of such project is a funded projects in thin film batteries lab. On one hand, lithium based batteries and alternative battery technology systems like magnesium, zinc, and aluminium based batteries are moving to new form factors, becoming paper-thin, adaptable, rollable, stretchable, etc. On the other hand, manufacturers are try hard to offer large batteries aimed at addressing the large-sized electric vehicle, residential and grid applications. The **THIN FILM BATTERIES LAB** at KITS is focused on the former, thanks to the development of IoT, wearable sensors, Radio Frequency Identification (RFID) tags, defibrillators, neural stimulators, and pacemakers. The Science and Engineering Research Board-Department of Science and Technology (**SERB-DST**), has twice provided funding for Batteries research at the Department of Applied Physics, KITS to the tune of 60 lakhs. The Department of Atomic Energy-Board of Research in Nuclear Sciences (**DAE-BRNS**) has also funded the batteries research at Department of Applied Physics, KITS to the tune of 19 lakhs. The project holders were supported by the **PROFESSIONAL DEVELOPMENT ACCOUNT** fund by **KITS**. The project investigators were encouraged to utilize the PDA money for purchase of equipment's, purchase of chemicals or spend for any other research needs. With the support of Government of India and KITS, the Department has full-fledged facilities for developing microbatteries. The **THIN FILM BATTERIES LAB** has two patents and Scopus, Web of Science indexed national/international publications in reputed journals under RSC, ACS, Elsevier, Springer and other. To its credit, the lab has collaborations with Advanced Batteries Lab, National University of Singapore, Institute of Physics, Academia Sinica, Taipei, Center for Condensed Matter Sciences, National Taiwan University and with other national labs.

Products

THIN FILM BATTERY

Coin type batteries

CELL CONSTRUCTION
TYPE: 2016 COIN CELLS
CELL VOLTAGE: ~ 3 V



Cathode:

LiV_3O_8 thin film nanorod

by pulsed laser deposition

method

Anode:

Name of the Investigator	Project No.	Funding Agency	Title of the project and duration	Amount sanctioned
Project investigators: Dr.A.Sakunthala Dr.S.Rajesh	EMR/2017/003227 dated 16.7.2018	**Science and Engineering Research Board-Department of Science and Technology** **SERB-DST-EMR**	Pulsed laser deposition grown thin/thick film of LiV_3O_8 nanorods for lithium metal battery applications Just completed 5.8.2018-5.8.2021 **Three years**	₹ 44,35,844

Lithium metal

Electrolyte:

1 M $LiPF_6$ in EC & PC

Specific capacity: 200 mAh/g

Images of the the coin cells constructed in automatic MBraun Glove box, with moisture and oxygen less than 1 ppm and its direct voltage output using a multimeter.

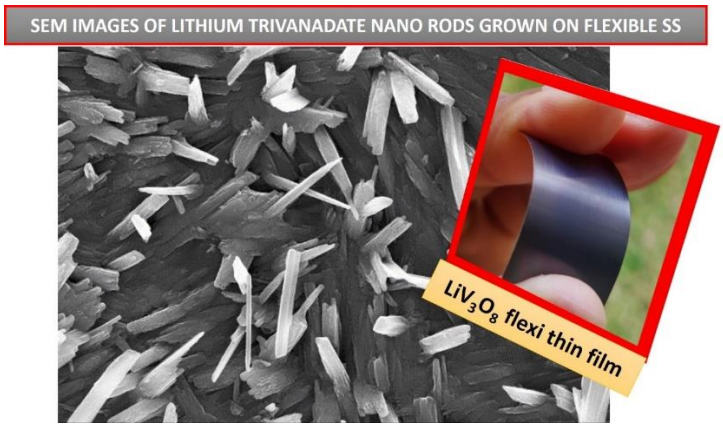
Department of Science & Technology, Government of India

सत्यमेव जयते

Number of Patents filed from the projects: 2

LITHIUM TRIVANADATE THIN FILM NANORODS BY PULSED LASER DEPOSITION TECHNIQUE; File No: 202041024467

METHOD OF MAKING VERTICALLY ALIGNED LiV_3O_8THIN FILMS ON FTO BY SPRAY PYROLYSIS; File No: 202141009407



Total Publications from funded projects: 28

Highly crystalline V_2O_5 and V_6O_{13} thin films by PLD and a study on morphology transition of V_2O_5 by post annealing, Vacuum Letters, 187, 110097, 2021 **IMPACT FACTOR: 3.62**

Thin film LiV_3O_8 nanorod formation through Pulsed Laser Deposition and the effect of heat treatment, Vacuum Letters, 182, 109722, 2021 **IMPACT FACTOR: 3.62**

Research Fellows worked under project

Mr. Rojin Varghese and Mr.Shobin Vijay worked as the project assistants in DST-SERB project. The students filed two patents based on their work and explored on the growth of vertically aligned nanorods on flexible stainless steel conducting current collecting electrodes.

PROJECT OUTCOMES FROM FUNDED PROJECT

Energy Storage Devices are always in demand for zero carbon emission environment. The funded projects on energy devices focus on "**Solid State Batteries**" which is the next generation battery for powering small size devices like pace makers, other medical devices, IoT applications to the large sized Electric Vehicles. The Solid State Batteries are extremely of high energy density and safety in nature. The funded projects to the tune of ₹ 44,35,844 from the Science and Engineering Research Board-Department of Science and Technology (SERB-

DST-EMR), on the Energy Devices has resulted in the outcomes on patents, publications and products.