

Indian Science Technology and Engineering facilities Map (I-STEM)

Invites application for

The Partial Support to the Academic Users and Custodians for the fabrication & development of Indigenous Equipment/Products/Consumables (Format-2)

Proposal Format:

Support to Academic Institution/Start-ups in the development and testing of an R&D product and its promotion for further improvement to achieve the better performance at par with the imported equipment (A unique program of I-STEM to achieve the goal "Aatm Nirbhar Bharat").

(Equipment/tool/new software application for R&D/technical supplies like chemicals/ceramics/substrates or a value-added service)

Details of the Personal and financial Information

- | | |
|----------------------------|---|
| a. Name of the Faculty | Dr. K. Saminathan, M. Sc., Ph. D. |
| b. Name of the Institution | Kongunadu Arts and Science College (Autonomous)
College of Excellence (UGC)
G.N.Mills Post, Coimbatore - 641029, Tamil Nadu,
INDIA |
| c. Name of the Department | Chemistry |
| d. Name of the Lab | Clean Energy Research Laboratory |
| e. Mob. No. 9894843371 | f. Email ID ksaminath@gmail.com |

Project/Research topic Details:

- | | |
|--|---|
| a. Project Title | Aluminium-Air battery development and testing for Electric vehicle |
| b. Sub area | Energy storage |
| c. Area Description | Transport |
| d. Aims & Objective | <ul style="list-style-type: none">• Design a cell with 1 Ah capacity• Fabrication of Anode and Cathode• Mechanical recharging of the cell• Heavy load testing |
| e. Duration | 06 months |
| f. Total Cost | Rs. 2,00,000. |
| g. Project Summary | Enclosed |
| h. <u>Technical Details : Enclosed</u> | |
| i. Industry/Institute Collaboration: | No |
| j. Funding required from I-STEM (with justification) | |
| a. Funding required from I-STEM (with justification) | <ul style="list-style-type: none">• Scientific materials support is expected from I-Stem. We already developed small cell and published in peer reviewed journal. We need financial support to go for prototype and test the battery. |

- Materials mentioned in consumables are necessary for fabrication and testing of the cells.

b. Expected output and outcome

An Aluminium-Air battery with mechanical recharging and 1 Ah capacity per cell and it can withstand for heavy load testing

c. Additional Details if any

Nil

k. Details of Institution's Bank Account:

(Please send a copy of the cancelled cheque and I-STEM ECS Form with PAN, GSTIN and Registration Certificate (if any) carrying all the information needed)

Beneficiary Name: The Principal, Kongunadu Arts and Science College	GSTIN:	PAN:
Bank Account No.: 170701000000608	Name of the Branch: IOB, G. N. Mills	
IFSC Code: IOBA0001707	Type of Bank Account: Savings	

Note: The users will submit the original invoice (duly approved by the Head of the Institution/Start-ups) raised by the Host Institution through Speed post to the Nodal Officer, I-STEM, Indian Institute of Science, Bangalore.

Note: A scan copies of all the bills must be uploaded to the portal.

PI declares that

1. the proposed project is checked using the available software for plagiarism and it is not copied in any form from the other resources/project.
2. This is completely new idea which need to be developed especially for the Indian Society.
3. No idea/contents without acknowledgement is/are used to prepare the proposal.

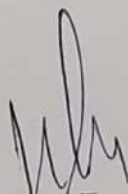
Signature with Email/Mobile No.



All the PIs,
Dr. K. Saminathan, M.Sc., Ph.D
Assistant Professor
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Kongunadu Arts and Science College
Coimbatore - 641 029, Tamil Nadu.



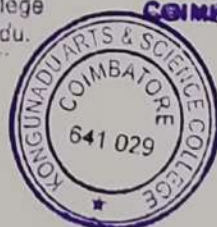
I-STEM Representative,



Head of Department,



Head of Institution



HEAD OF CHEMISTRY,
KONGUNADU ARTS & SCIENCE COLLEGE
COIMBATORE-641 029

PRINCIPAL
KONGUNADU ARTS & SCIENCE COLLEGE
COIMBATORE-641 029.

The Al-air battery is an encouraging technology that can achieve the projected upcoming energy demands. Al-air battery has a practical energy density of 4.30 kWh/kg. This is inferior to only Li-air battery which has a practical energy density of 5.20 kWh/kg and is much advanced than Zn-air which has a practical energy density of 1.08 kWh/kg. A Thermodynamic revision by has exposed that the extreme open-circuit potential of Al anode can be -1.87 V vs. standard hydrogen electrode at pH 14.6 instead of the broadly cited -2.34 V. This value cannot be altered by eliminating parasitic reactions.

Al-based air batteries may suggest substantial cost savings and safety enhancement over Li-ion batteries as these hold lower reactivity, easy to handle, and superior safety. Al-air batteries have been designed using aqueous, organic, ionic-liquid (IL), and polymer gel-based electrolytes. Semi-solid electrolytes eradicate the difficulties related with leakage of the battery systems using liquid electrolytes.

Al-air battery is uniquely placed amongst metal-air battery classifications. The crucial advantages of the Al-air battery are: energy density is as abundant as ten times to that of Li-ion batteries, Al-anode is extremely- light weight, low-priced, non-toxic and safe, Al-based redox couple provides considerable higher storage capacity as Al possesses high Theoretical ampere-hour capacity and complete specific energy, Al can be easily recycled.

a) **TRL: 06**

b) **Methodology & c) Design and Development**

Typical Metal-Air battery would consist of a metal as anode, type of carbon preferably incorporated with metal oxide as cathode for oxygen reduction reaction (Air electrode) and an electrolyte (KOH).

Our research group have successfully fabricated the electrodes (anode and Air-cathode) with good performance, for different Metal-Air system. All the results are published in peer reviewed journals¹⁻³.

The present work aims the fabrication and testing of prototype Al-Air Battery (minimum 10 Nos with duplication) to withstand for high-rate discharge for Electric vehicles.

d) **Facilities and Instrumentation required**

None

e) **Consumables**

1. Battery grade Aluminium
2. Separator
3. Electrolyte KOH
4. Cell Container
5. Cell Terminals
6. Electrical meters

References

- (1) Saminathan, K.; Arts, K.; Selvam, M. Water Soluble Graphene as Electrolyte Additive in Magnesium-Air Battery System Water Soluble Graphene as Electrolyte Additive in Magnesium-Air Battery System. **2014**, No. November. <https://doi.org/10.1016/j.jpowsour.2014.11.079>.
- (2) Kumar, K. K.; Brindha, R.; Nandhini, M.; Selvam, M.; Saminathan, K.; Sakthipandi, K. Water-Suspended Graphene as Electrolyte Additive in Zinc-Air Alkaline Battery System. *Ionics (Kiel)*. **2019**, 25 (4), 1699–1706. <https://doi.org/10.1007/s11581-019-02924-7>.
- (3) Kandeegan, R.; Brindha, R.; Manojkumar, K.; Batoo, K. M.; Raslan, E. H.; Hadi, M.;

Imran, A.; Saminathan, K. Revealing the Synergetic Electrocatalyst Behaviour of Kish Graphite Recovered from Polyethylene Plastics. *Mater. Lett.* **2021**, *297*, 129740.
<https://doi.org/10.1016/j.matlet.2021.129740>.