

STable high-capacity lithium-Air Batteries with Long cycle life for Electric Cars

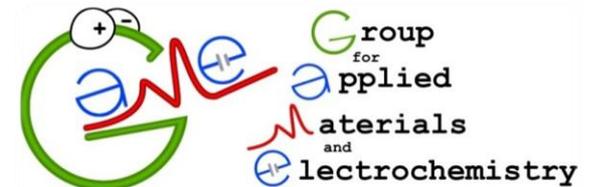
GC.NMP.2012-1-314508



<http://www.fp7-stable.com/>

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<http://areeweb.polito.it/ricerca/elettrochimica/>



STABLE EGVI meeting
Bruxelles- January 21st, 2014



✓ Overview

THEME [GC.NMP.2012-1] Innovative automotive electrochemical storage applications based on nanotechnology

Grant agreement for: Collaborative project

Project acronym: **STABLE**

Project full title: "Stable high-capacity lithium-Air Batteries with Long cycle life for Electric cars"

Grant agreement no: 314508

Eu contribution: 2,495,517.00 euros

Duration : 3 years. 1 September 2012- 31 August 2015



✓ Partners



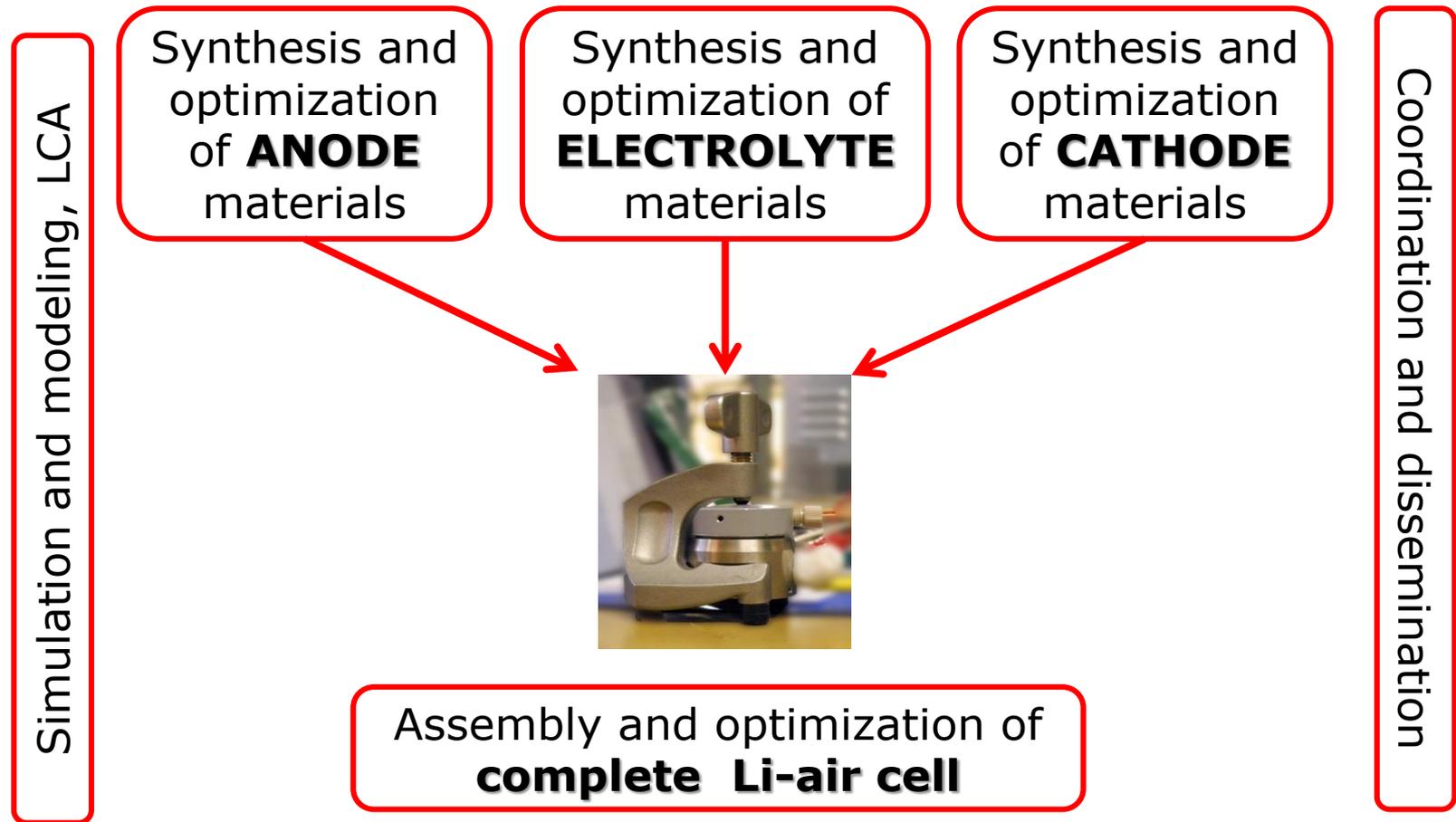
Beneficiary	Expertise and roles in the project
POLITECNICO DI TORINO (POLITO) - ITALY 	materials synthesis and characterization, lithium air battery electrochemical measurement, project coordination and management.
ACONDICIONAMIENTO TARRASENSE ASSOCIACION (LEITAT) - SPAIN 	nanomaterials synthesis, surface treatment and cell simulations.
L'UREDERRA, FUNDACION PARA EL DESARROLLO TECNOLOGICO Y SOCIAL (LUREDERRA) - SPAIN 	nanomaterials synthesis and characterization and fine chemistry.
SWEREA IVF AB (IVF) - SWEDEN 	nanomaterials properties and applications, industry manufacturing: cell assembly and life cycle assessment
UNIVERSITY COLLEGE CORK, NATIONAL UNIVERSITY OF IRELAND, CORK (UCC) - IRELAND 	advanced lithium nanotechnology, cell simulations and assembly.
SAKARYA UNIVERSITESI (SAU) - TURKEY 	nanomaterials development, electrolytic deposition
CELAYA, EMPARANZA Y GALDOS INTERNACIONAL, S.A. (CEG) - SPAIN 	battery manufacturing, technical requirements from market.
ELAPHE, PODJETJE ZA RAZVOJ IN PRODAJO ELEKTRICNIH VOZIL TER ENERGIJSKIH VIROV D.O.O (Elaphe) - SLOVENIA 	prototype production and technique supports.



✓ Overall goals

The overall objective of STABLE is to obtain Li-air battery cells with **specific capacity of >2000mAh/g** and an improvement of **cycle life to 100-150 cycles** through the innovations of battery anode, cathode, electrolyte materials and technologies, as well as assembly of batteries cells which are crucial on battery performance, cost and environmental impact.

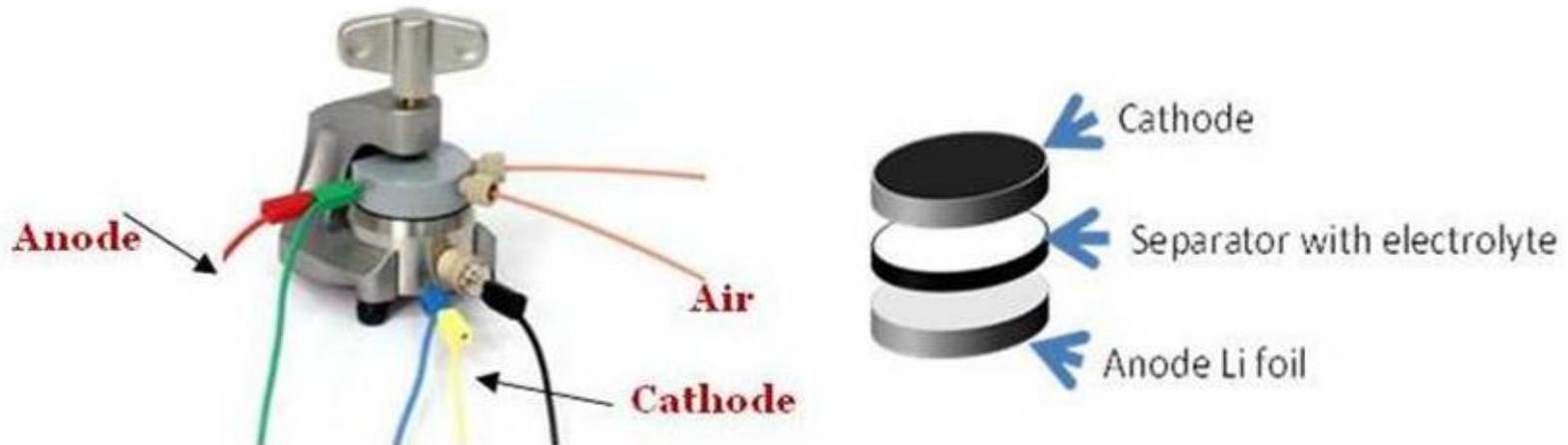
✓ General organization



✓ The first strategy

Standization of the measurement cell:

Cathode
Anode
Electrolyte
Measurement cell

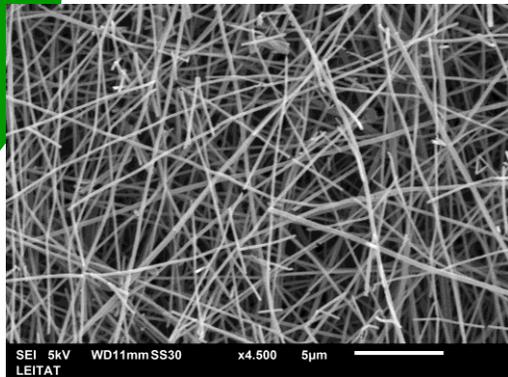


Scheme of the EL cell used as reference for the electrochemical characterization

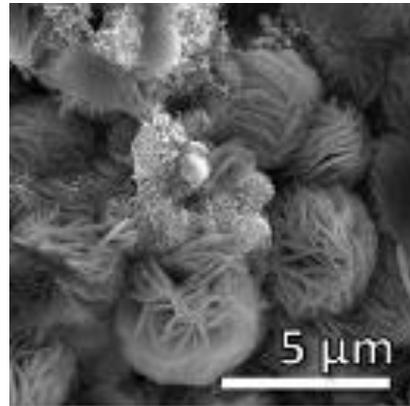
This «standard cell is very important to compare the electrochemical activity of new materials prepared by partners of the project

✓ **materials**

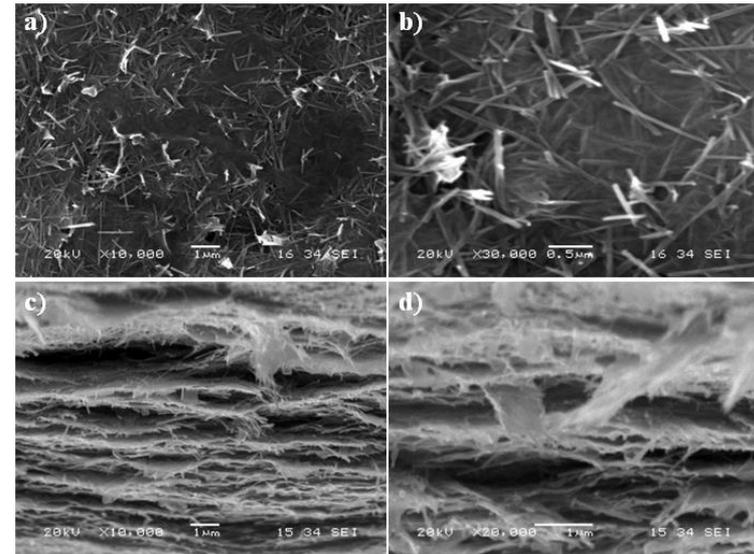
- Different cathodic carbon based materials with or without catalyst



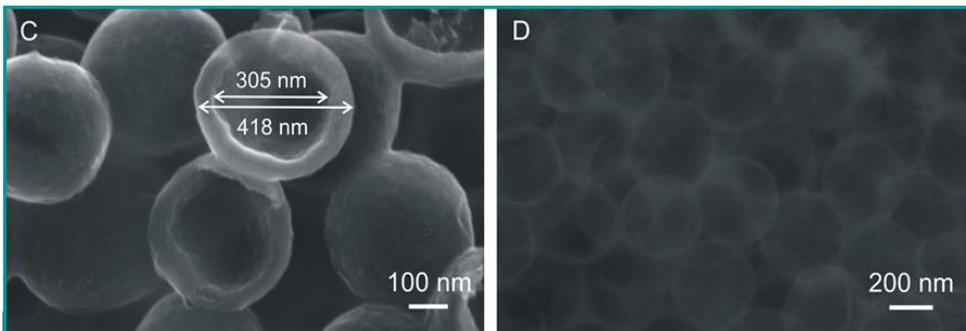
MnO₂ Particles onto CNFs



MnO₂ Particles



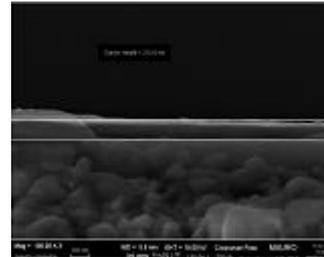
Low and high magnification SEM images of a, b) surface morphology of the GO/ α -MnO₂ composite structure and c, d) cross-sectional SEM images of the GO/ α -MnO₂ composite structure.



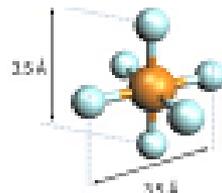
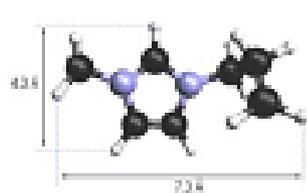
SCS and HCMS and FESEM images of the HCMSC.

✓ **materials**

- Different strategies to protect Li anode

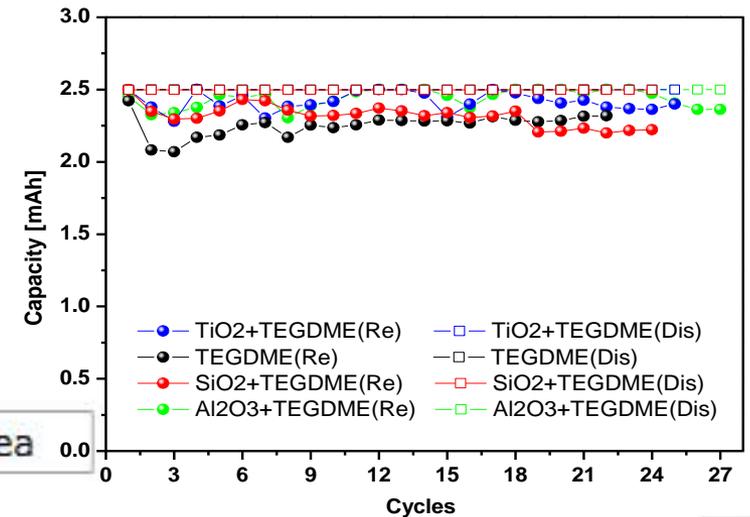
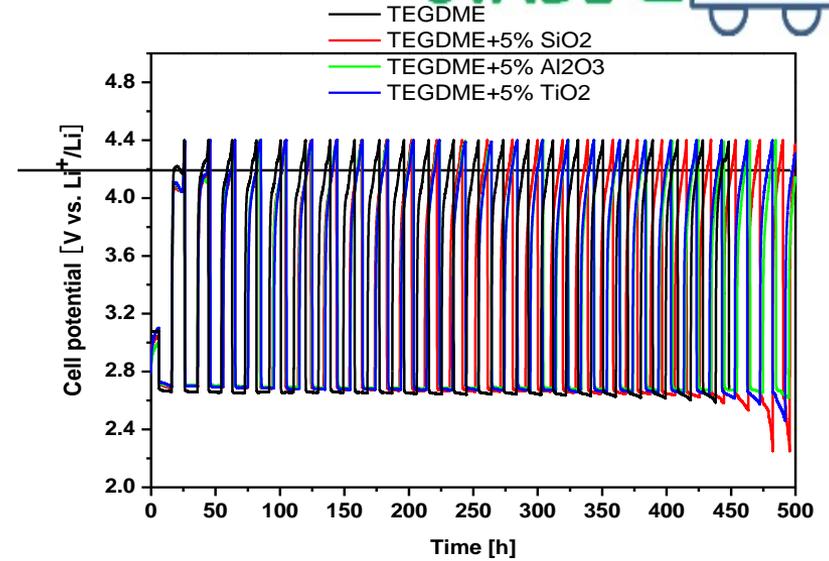
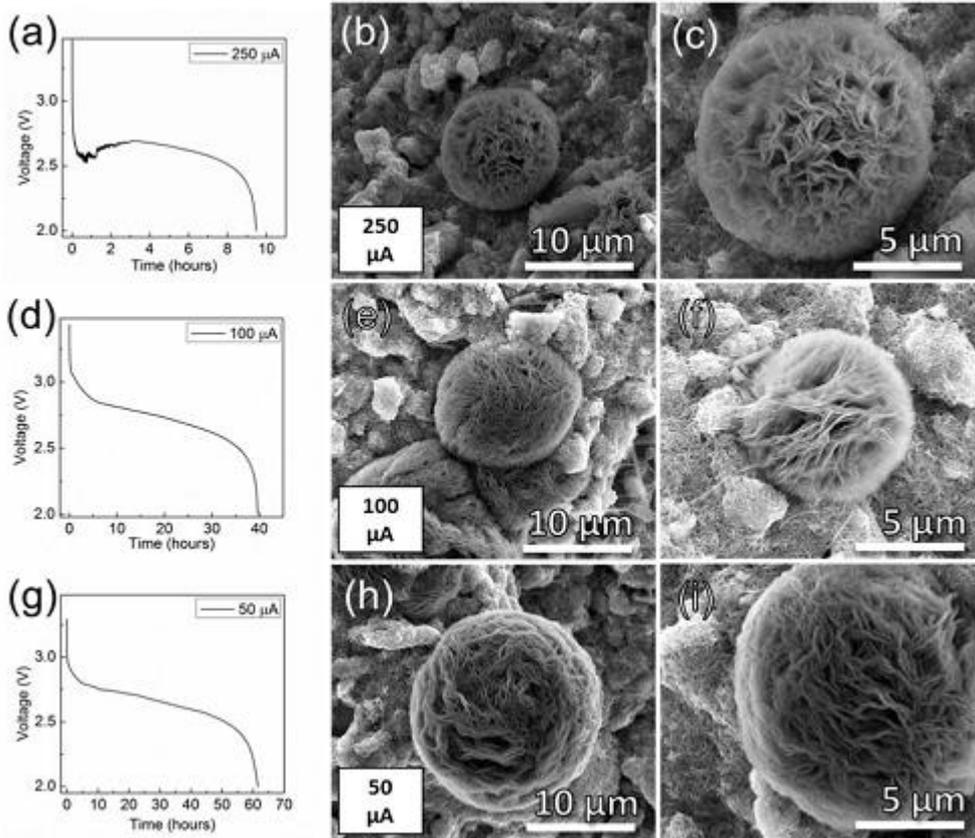


- Membrane to prevent moisture inlet



- Liquid electrolytes with or without additives, ionic liquids

✓ first results



Toward larger area



40 cm² area

✓ Problems to overcome

- Different cathodic reaction mechanisms
- Too large voltage gap between charge and discharge processes
- Compatibility electrolyte-electrodes
- Riproducibility and comparison of results
- Anode protection

✓ The future strategy

- Strong work on nanostructured cathode materials /cathode design
- high chemical stability electrolyte (polymer?)
- Cell design (air or oxygen?) (flowing or dead end feed?)



POLITECNICO
DI TORINO



Thank you for your attention



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