Project scope and definition

CIC energiGUNE
energy cooperative research centre

2014

Vitoria, 12 de mayode2014

CIC energi GUNE
energy cooperative research centre

1. CIC Visioning
2. CIC Research Areas
3. CIC Platforms & Facilities

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1. **CIC Visioning**
2. CIC Research Areas
3. CIC Platforms & Facilities

CIC Visioning… mission & vision definition

To become a top 5 Research Centre in Europe, focused on basic research energy related materials oriented to storage

MISSION

Play a **leading role** on the international scientific stage focused **on basic research in energy** related **materials** oriented to storage applications, contributing to industrial competitiveness of Basque businesses, through:

- *Excellent and breakthrough research*
- *Transfer of technology and knowledge to local industry*
- *Coordination of Basque technology and research efforts (in energy storage)*

2016 VISION:

Become a top 5 research centre in Europe in CIC focus areas (EES, TES) and the leader of collective energy storage R&D effort in the Basque Country, generating measurable impact for Industry

CIC Visioning… mission & vision definition

Involving leading companies working within the energy sector

- Each company helps strengthen the project and gives it a broader view of the real needs of the energy world. With their market expertise, the companies can speed up introduction and dissemination of advances in research. We work with all of them to build a strategic collaboration.

CIC Visioning… mission & vision definition

current situation and future development

Investment	Researchers	High Impact Publications
22 M€ (2013) 43 M€ (2016)	38 (2013) 68 (2016)	26 (2013) 60 (2016)

Patents	EU funded projects	Projects with Industry
5 (2013) 12 (2016)	5 (2013) 10 (2016)	3 (2013) 10 (2016)

Organized events	Participation in conferences	Nationalities
16 (2013) 40 (2016)	56 (2013) 150 (2016)	10 (2013) 12 (2016)

CIC Visioning… mission & vision definition

R&D value chain: CIC´s role and cooperation scheme in the Basque Environment.

	Basic research	Applied research	Industrial dev.
			
Main players	CIC energi GUNE energy cooperative research centre	IK4 Research Alliance; tecnalia	COMPANIES
	+	+	+
	UNIVERSITIES	TECH. CENTRES	IK4 Research Alliance; tecnalia
Partners	UPV EHU; MONDRAGON UNIBERTSITATEA	+ CIC energi GUNE; UPV EHU; MONDRAGON UNIBERTSITATEA	CIC energi GUNE

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CIC Research Areas

focused on Energy Storage related Research lines looking for critical mass

Energy Storage Types:

- **Electrochemical Storage**
- **Thermal Storage**
- Mechanical Storage
- Chemical Storage
- Superconducting Magnetic ES

EES: POWER STORAGE; BATTERIES and SUPERCAPS

TES: THERMAL ENERGY STORAGE

CIC Research Areas

in both cases oriented towards real applications and needs

EES (Batteries & Supercaps)

Elevation

Mobility

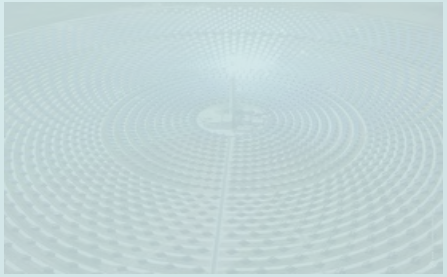
Stationary Applications

CIC Research Areas

in both cases oriented towards real applications and needs

TES (Thermal Energy Storage)

Concentrated solar Plants



Energy efficiency for industrial processes

High temp. Industrial processes

CIC Research Areas

covering different value chain steps

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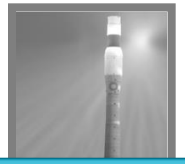
EES
(Batteries & Supercaps)



TES
(Thermal Energy Storage)

Multidisciplinary approach	System oriented	Industry & Tech Transfer
Structure surf. and analysis	Na based	Prototyping & Industrial dev.
Solid Electrolytes	Li based	
Modelling & simulation	Capacitors	
Materials	SENSIBLE HEAT STORAGE Design New Concepts, modeling, prototyping & testing	
	PHASE CHANGE MATERIALS Design New Concepts, modeling, prototyping & testing	
	THERMOCHEMICAL STORAGE Design New Concepts, modeling, prototyping & testing	

CIC Research Areas

research Team

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Dr T Rojo

- **EES Scientific Director** at CIC energiGUNE.
- Professor of Inorganic Chemistry (UPV).
- Over 30 years experience on the research of materials for batteries.
- More than 350 papers.

Dr J Kilner

- Professor of Materials Science (Imperial College London).
- European Editor for Solid State Ionics Journal.
- Over 30 years experience on the research of conducting ceramics.
- Over 250 papers & several patents.

Dr M Armand

- Honorary Research Director at CNRS-LRCS.
- Proffesor Université de Picardie.
- Over 30 years involvement on the research of materials for batteries.
- Over 70 papers and about 80 patents.

Dr. E. Goikolea

- EES Associate Researcher at CIC energiGUNE.
- Supercapacitors research line especialist.
- Over 5 years research experience.

Dr M Casas-Cabanas

- **EES Group Leader** at CIC energiGUNE
- Structure Surface & Analysis research group especialist
- Over 10 years research experience.

Dr R Mysyk

- **EES Associate Researcher** at CIC energiGUNE.
- Supercapacitors research line especialist.
- Over 10 years research experience.

Dr MA Munoz

- **EES Associate Researcher** at CIC energiGUNE.
- Li-ion research line especialist.
- Over 10 years research experience.

Dr. D. Shanmukaraj

- EES Associate Researcher at CIC energiGUNE.
- Solid electrolyte research line especialist.
- Over 5 years research experience.

Dr D Saurel

- **EES Associate Researcher** at CIC energiGUNE.
- Na-ion & supercapacitors research lines especialist.
- Over 10 years research experience.

Dr G Singh

- **EES Associate Researcher** at CIC energiGUNE.
- Prototyping & industrial devices research line especialist.
- Over 5 years research experience with important industry experience.

Dr Bruno D'Aguanno

- **TES Scientific Director** at CIC energiGUNE.
- Materials for TES research group especialist.
- Over 30 years research experience.

Dr A Faik

- **TES Associate Researcher** at CIC energiGUNE.
- Latent and sensible heat storage research lines especialist.
- Over 5 years research experience.

CIC Research Areas

Reference facilities: main laboratories

EES (Batteries & Supercaps)

LABS 1,2,3

LAB 4 & Platforms

LAB 5a, Dry Room

LAB 5b

Synthesis & cell assembly → Characterisation lab → System integration & development → Testing

LABS 2 & 5b: In operando and postmortem analysis

TES (Thermal Energy Storage)

Synthesis lab → Characterisation lab + 

Thermal oil test loop

CIC Research Areas

Reference facilities: Tech.Platforms

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Characterization Techniques

- Thermal Analysis Platform
- EM Platform
- X-Ray Platform
- Surface analysis unit
- NMR Platform
- PPMS
- General AnalysisTechniques

Prototyping and testing facilities

DRY ROOM

55m², 5 people,
-65 ºC Dew Point

TEST LOOP

Thermal Oil Test Loop

CIC Research Areas

Collaboration framework

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CIC Research Areas

integrated approach with partners covering the whole value chain

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Components & cell manufacturing → **CELLS** → **MODULES** Design & management → **BATTERY PACKS** Construction → **SYSTEM INTEGRATION** → **ANALYSIS POST MORTEM**

EES
(Batteries & Supercaps)

- **Modelling, lifetime, calendar life and FMEA**
- **Thermal Management**
- **Electromechanical**
- **TICs & sensors**
- **Control & Power Electronics Engineering**

CIC Research Output

CIC has a high level outpur at events, journal,patents…

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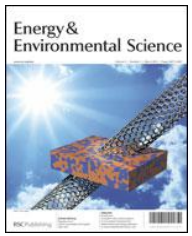
Publications: 27 (EES: 15 / TES: 12) with a Impact Factor >4.0



Energy Environ. Sci., 2012,**5**, 5884-5901
"**Na-ion batteries**, recent advances and present challenges to become low cost energy storage systems"
V Palomares, P Serras, **I Villaluenga**, K B. Hueso, **J Carretero** and **T Rojo**

Amongst **TOP 10 most-read** RCS article on a monthly basis since publication in Feb12

Organisation of events:42

Seminars
Workshops
Conferences

Participation on Conferences: 90

7 (2010) → 29 (2011) → 22 (2012) → 32 (2013)

Patents: 5 (EES: 3 / TES: 2)

in progress for approval

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Electrochemical Storage:

"Li-ion batteries; Supercaps & Others"

2. CIC Platforms & Facilities

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   - **Thermal Energy Storage**
   - **"**
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CIC Core Facilities:

Cutting edge Laboratories and Infraestructures Jan.2013

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EM Platform

FEI - TECNAI G2 F20 S-TWIN (TEM)

FEI - Quanta 200FEG (SEM)

X-Ray Platform

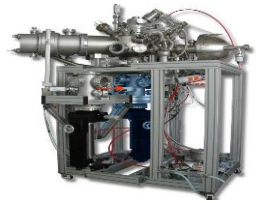
Bruker D8 ADVANCED DIFFRACTOMETER SYSTEM - SAXS

Bruker: NANOSTAR U equipped with Vantec 2000 Detector

Surface analysis unit

AGILENT - AFM/STM Microscope AGILENT 5500

Tecnovac (Pfiffer) - CLASSIC 500 SP SPUTTERING SYSTEM



Multi-Method Surface Analysis System for XPS/ UPS/ AES/ SEM/ SAM/ ISS

NANONICS MULTIVIEW 2000 TERS with RAMAN SPECTROMETER

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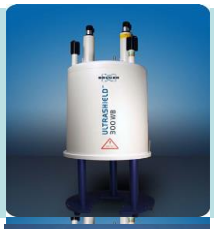
NMR Platform



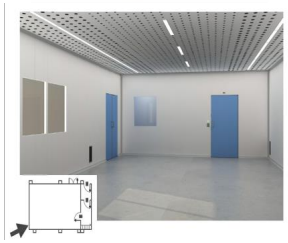
Bruker Avance III 200 MHz

Bruker Avance III 500 MHz

PPMS

PPMS Evercool II

Dry Room



55m^2, -65 ºC Dew Point, 5 people

Thermal Analysis Platform

STA 449 F3 system NETZSCH with DIL 402 C/4

DSC -Q2000 TA INSTRUMENTS

NETZSCH LFA 457 MicroFlashTM

GAS PYCNOMETER - AccuPyc 1340 MICROMERITICS

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General Analysis Techniques

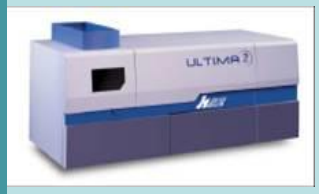
VARIAN - UV/VIS/NIR VARIAN Cary 5000 SPECTROMETER)

3x JACOMEX - GLOVE BOXES

Perkin Elmer: FTIR spectrum 400 DTGS

MICROMERITICS - ASAP 2020 MICROPORE DRY DESCRIPTION

General Analysis Techniques



HORIBA - ULTIMA 2 Sequential Spectrometer

MASTERSIZER 3000 – PARTICLE SIZE ANALYZER

FT - IR SPECTROMETER + MICROSCOPE BRUKER VERTEX V70

Millipore Qtix

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Battery testing lab

CLIMATIC CHAMBER – Vötsch 7004

4 x BIOLOGIC VMP3 POTENCIOSTATS

3 x BIOLOGIC VSP POTENCIOSTAT

IMPEDANCE ANALYZER SOLARTRON 1260 with Dielectric Interface

Battery testing lab

MACCOR Battery tester 128 channels