

European infrastructure for spectroscopy, scattering and imaging of soft matter

### **Transnational Access made easy by EUSMI**





### If you only remember two things ....

### **EUSMI is free**

- Use of instruments and services (TNA)
- Accommodation and subsistence costs are covered for up to 2 persons;
- Travel cost is covered up to 500 Euro per person.
- Support for open access publication

### **Contact our Industrial Liaison Officer:**

Dr. Anna Stenstam, CR Competence AB, Sweden

- Help you find the right instruments
- Help you with application and proposal





### Outline

- Overview and key facts
  - Who are we?
  - What does EUSMI offer?
- EUSMI and industry
  - Overview of industrial participation
  - Successful case stories
- How to apply?
  - Submit your proposal via EUSMI web portal
  - Special support for industrial users
- Dos an Donts



### **Overview and key facts**

- Who are we?
- What does EUSMI offer?

### The consortium

- 23 Beneficiaries
  - 9 companies
  - 6 research centres
  - 8 universities
- 15 partners providing transnational access
- Coordinator : Prof. J.K.Dhont, Forschungzentrum Jülich GmbH

### Timeline

- Start date 01. July 2017
- Duration: 48 months + 6 months extension due to Covid-19
- Extension till **31.12.2021**

### TNA at a glance : 5 work packages

- WP1: Spectroscopy and rheology facilities
  - NMR: Univ. Lille, Adam Mickiewicz University
  - Rheology: ETH Zürich, FORTH
- WP2: Scattering and diffraction facilities
  - Neutron scattering: Jülich-JCNS,
  - cSAXS: Paul Scherrer Institut
  - Light scattering: Jülich-IBI4, FORTH, ULUND
- WP3: Imaging facilities
  - AFM: University of Bayreuth
  - Electron microscopy : EMA, University Antwerp
  - Confocal microscopy: University Edinburgh



EH zürich









Electron Microscopy for Materials Science University of Antwerp



THE UNIVERSITY of EDINBURGH

### TNA at a glance : 5 work packages

- WP4: Synthesis and up-scaling facilities
  - BIOMA: functional nanoparticles
    - biomedical application, biosensor
  - DWI: intelligent materials
    - functional latex particle, microgels
  - SyMO-Chem: tailored molecular synthesis
- WP5: Supercomputing : Jülich JURECA
  - 1872 compute nodes
  - 12 visualisation nodes
  - total of 45216 CPU nodes



**DWI** Leibniz-Institut für Interaktive Materialien







### **EUSMI and Industry**

- Overview of industrial participation
- Successful case stories



### **Key achievements**

- **19** applications from industry
  - **10%** of all accepted applications
- 15 companies
  - 9 different business areas
  - 8 different countries of origin
- 26% of accepted industry-applications are from SMEs
- 12 EUSMI labs involved
- **44** in-depth discussions with industry
- 5 commercialisation plans



### **Business areas – accepted proposals**





### **Successful case stories**

Case story 1 : Characterization of surfactant aggregates

- KAO Chemicals Europe
- Business sector: personal and home care
- Challenge : to correlate the macroscopic behavior with the structure of the surfactant aggregates
- Method: small and wide angle X-ray scattering
- EUSMI: University Lund

Case story 2 : Film forming effect on hair

- Provital
- Business sector: cosmetic ingredients
- Challenge : Hair structure after treatments?
- Method: Electron Microscopy
- EUSMI: EMAT, University Antwerp





### EUSTII

Case story 3 : Collaboration with OrganoClick AB

- Business sector: clean technology, functional wood
- Challenge : fundamental structure-property relationship of next generation wood protection.
- Method 1: Solid-state NMR at University Lille
- Method 2: Electron microscope at EMAT University Antwerp





chemical structure at atomic scale



morphology penetration depth fixation mechanism



### **Testimonials from industrial users**

"We were able to get a detailed image of the hair structure along the fiber after different treatments so that <u>we</u> <u>could select the best</u> <u>option. "</u>

"These results will help us push our projects and develop <u>new</u> <u>products</u> <u>with stronger scientific</u> <u>base."</u> "It has been an exceptional collaboration, with ideal communication and <u>scientific advice</u> <u>before and during the</u> <u>process</u>."

" As a small- medium size Greentech Company with a great focus on the research and development, <u>EUSMI</u> <u>helped us a lot in order to</u> <u>characterize the next generation of</u> <u>our environmentally friendly</u> <u>products.</u>"



### How to apply ?

- Submit your proposal via EUSMI web portal
- Special support for industrial users



### Apply for Access at: http://eusmi-h2020.eu

Registration  $\rightarrow$  find your instrument  $\rightarrow$  write and submit the proposal



### After logging in, you can come to the User Area





### **Special support for industrial users**



Click <u>here</u> to learn more.



# DOs and DONTs -- rules for application



### **DOs and DONTs**

- Do contact me or Anna for potential applications.
- Do bookmark the EUSMI web portal and register.
- Don't hesitate ! EUSMI runs till 31.12.2021.
- Don't overlook the **Eligibility Rule** 
  - The majority of the proposers must be affiliated to countries which are different from the instrument location
  - Example: Provital case
    - proposers  $\rightarrow$  affiliated to Spain
    - applied instrument  $\rightarrow$  located in Belgium
    - Formally eligible ! Proposal entered review process immediately.



### **Contact information**

- Web portal
  - http://eusmi-h2020.eu •
- Get our newsletter as registered user
- Write an email
  - anna@crcom.se •
  - p.lang@fz-juelich.de •
  - y.liu@fz-juelich.de
- Follow EUSMI on Twitter
  - @EUSMI\_H2020



#### ACCESS TO:

- a neutron scattering facility
- a coherent x-ray beam line
- most advanced electron microscopes
- world leading synthesis laboratories
- one of the fastest supercomputers in Europe
- about 70 highly specialized instruments for a large variety of experiments

#### How to make use of EUSMI

#### All soft matter scientists are invited to register at

#### www.eusmi-h2020.eu

Registered users can take advantage of the EUSMI transnational access programme by submitting an application via the online proposal system at the EUSMI web portal. Proposals will be evaluated within a month by a panel of internationally renowned experts.

#### WHEN A PROPOSAL IS ACCEPTED

All costs for using the EUSMI infrastructure, travel, accommodation and subsistence costs will be covered by EUSMI for up to 2 persons per proposal.



### Life circle of a proposal

### Life cycle of EUSMI proposal



- Status report will be automatically generated
- · Corresponding person will receive notification emails





## Introduction to TEESMAT

Philippe AZAÏS (CEA)





### TEESMAT :

### an open innovation <u>Test bed for Electrochemical Energy Storage MATerials</u>

- The European battery market is expected to increase by a factor of 4 to 10 by 2025
- The development of a competitive battery value chain in Europe is one of the top priorities of the European Commission.
- Progress of electrochemical energy storage devices (EESD) depends on characterization and understanding of all basic processes.
- →Access to advanced characterisation solutions enables industry to apply a knowledge-based approach, which is essential to accelerate innovation and reduce the cost of technologies.





### But...

1- Many novel techniques proposed by leading EU research labs are largely inaccessible and underused by companies especially in the rapidly developing battery sector.

- 2- a- Lack of unified materials databases
  - b- Companies' lack of specialised expertise on physics & data analysis
    - c- Insufficient industrial relevance of techniques and resulting data

due to the lack of standard operating procedures, reproducibility, user-friendly interfaces and <u>data presentation</u>





TEESMAT gathers qualified private/public *Service Providers* (SPs) to :

- develop and demonstrate novel materials characterisation techniques, data analytics & services and
- apply them to 25 industrial User Access Cases (UACs). UACs are specific, unsolved problems faced by industrial Service Users (SUs).

The 10 partner SUs are representative of the future clients to be served by the OITB.



### Project description: TEESMAT partners

Acronym	Country		N°	type	SP / SU?	
CEA	FR		1	RTO	SP	
ESRF	FR		2	RTO	SP	
SERMA	FR		3	SME	SP	
ZSW	DE		4	RTO	SP	
VITO	BE		5	RTO	SP	
TECNALIA	ES	- <b>1</b>	6	RTO	SP	
CERTH	GR		7	RTO	SP	
<b>IN-CORE SYS</b>	FR		8	SME	SP	
SEMILAB	HU		9	SME	SP	
WAVESTONE	LU		10	LE	SP	Technology
ZINERGY	UK		11	SME	SU	Printed Zn & Li-ion batteries
LITHOPS	IT		12	LE	SU	LFP Li-ion batteries
UMICORE	BE		13	LE	SU	Li-ion (all-solid state) cathode materials
YUNASKO	Ukraine		14	SME	SU	LIC (lithium-ion capacitors)
GENES'INK	FR		15	SME	SU	Cu metallization and Cu nanoink for printed Li-ion batteries
ARKEMA	FR		16	LE	SU	LiTDI salt for Li-ion batteries
SUNLIGHT	GR		17	LE	SU	Lead acid batteries
NORTHVOLT	SW		18	SME	SU	Li-ion batteries
CRF	IT		19	RTO	SU	Li-ion batteries
CEGASA	ES	- Aliana and	20	SME	SU	Zn-air batteries
EBN	BE		21	NPO	SP	



### Project description: objectives of TEESMAT



TEESMAT aims to bring a comprehensive response to these critical bottlenecks faced by EU stakeholders in the field of electrochemical energy storage materials.

### **Overall objective:**

<u>To lower the barriers of access to industrially relevant, novel problem-solving techniques and</u> <u>services, including characterization and data analytics for large and small companies.</u> The **three core objectives of TEESMAT** are:

**OBJECTIVE #1** - To set-up an **Open Innovation Test Bed** (OITB) to provide effective, centrally managed access to advanced materials' characterization, modelling and data informatics;

**OBJECTIVE #2** - To demonstrate the OITB's added value by solving persistent, high-impact industrial problems;

**OBJECTIVE #3** - To ensure the OITB's growth, longevity, financial sustainability and stakeholder support.





## 30 types of novel characterization techniques enable multi-scale and multi-modal assessment of:

### 1- the Material Nature (intrinsic properties) and the Material Performance (components, coll los





**Project description:** How does it work? Novel characterization techniques and relationship between

modelling & simulation toolbox



SEMILAB INCORE CERTH TECNAL VITO ZSW ESRF CEA **TEESMAT Service Toolbox T1 Operando Nuclear Magnetic Resonance** Х Х T2 Glow Discharge Optical Emission Spectroscopy Х T3 X-ray scanning nano spectroscopy T4 ToF-SIMS coupled to Focused Ion Beam preparation Х Х **T5** Operando electrochemical assessment of electrodes Х Х Х T6 In-situ Optical Microscopy T7 Cell 3D imaging by X-ray Microtomography Х T8 X-ray micro & nano tomography Х Х **T9 X-ray Bragg Diffraction Microscopy** Х T10 Operando X-Ray Diffraction Х T11 Coherent X-Ray diffraction imaging T12 Acoustic measurement Х Х T13 Hard X-Ray total scattering Х T14 Small Angle Neutron and hard X-rays scattering Х T15 Nano-characterisation correlative analyses: HRTEM - EELS Х Х T15 bis Nano-characterisation correlative analyses: XPS T16 In-situ Electrochemical Raman spectroscopy Х Х T17 Incremental Capacity Analysis Х T18 Electrochemical Impedance Spectroscopy T19 In-situ Spectrometry for gas analysis Х T20 Accelerated degradation cell test Х Х T21 Heat flux measurement Х Х T22 Differential Scanning Calorimetry х х T23 Blast box and ARC Х T24 Operando multi-physics 3D mapping X X Х T25 Electrical cycling with sensors х T<sub>26</sub> In-line electrode material production control T27 Optical quality control Х T28 Quality control of coatings & deposited layers Х T29 Precision Coulombic Efficiency Test Х T30 Electron Paramagnetic Resonance (EPR) х



**TEESMAT** modelling and simulation Toolbox for the prediction of performance, durability and safety of material properties into the processed materials.



### Project description: How does it work?



Industrial Challenges & Needs are organized as five pillars under which materials

characterization activities will be carried out independently:

- Production process
- Performance (@ beginning of life)
- Durability
- Safety
- Standards & Regulations (S&R)





### Workflow of User Case description and solution





### External Service Users can provide User Cases to TEESMAT Service Providers and get

results for free during the duration of the project (until Aug. 2022)

**Requirements:** 

- <u>1</u> User case with a limited number of samples/required techniques
- Follow the procedure (1st step: fill in the form to describe the User Case) and give feedback
- Share the data about their cases in the TEESMAT database
- Leave the possibility to publish the data (to be discussed case by case)
- Sign a cooperation agreement with Philippe Azaïs, coordinator of the TEESMAT project



### External Service Providers can test their characterization techniques using User Cases

### from the TEESMAT project

### **Requirements:**

- Present their caracterization techniques to the TEESMAT consortium for an evaluation of the technique potential versus the needs
- Follow the TEESMAT procedure and use the tools when a measurement is requested
- Give feedback about the organisation and the future for the commercial activity
- Sign a cooperation agreement with Philippe Azaïs, coordinator of the TEESMAT project



### Contacts

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### https://www.teesmat.eu/





## Thank you for your attention

