SUSCHEM
European Technology Platform
for Sustainable Chemistry

Project Ideas

No.1

Feasibility and Limits of Aqueous Electrochemical Energy Storage Technologies relating to Sustainability, Safety and Scalable Manufacturing

No.2

Hydrogen Generation via Overall Electrolytic Splitting of Saline Water

Center for Physical Sciences and Technology

Vilnius, Lithuania

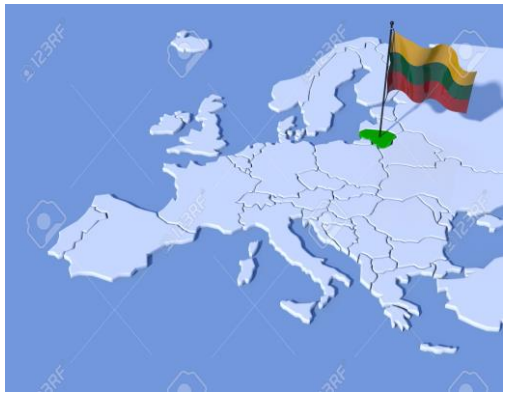
www.ftmc.lt

Dr. Jurga Juodkazyte

jurga.juodkazyte@ftmc.lt

CENTER FOR PHYSICAL SCIENCES AND TECHNOLOGY (FTMC)

- The largest scientific research institution in Lithuania (> 650 people)
  - Institute of Chemistry
  - Institute of Physics
  - Institute of Semiconductor Physics
  - Textile Institute
- Key competence areas of the Institute of Chemistry:
  - Electrochemical material science: energy conversion and electrocatalysis
  - Functional coatings (electroless deposition, electroplating, magnetron sputtering, ALD, anodizing)
  - Corrosion research (Accredited Corrosion Testing Laboratory)
  - Spectroelectrochemistry (SERS)
  - Characterization of materials structure (XRD, SEM, TEM, XPS)
  - Tribology
  - Chemical waste treatment technologies



Project idea No.1:

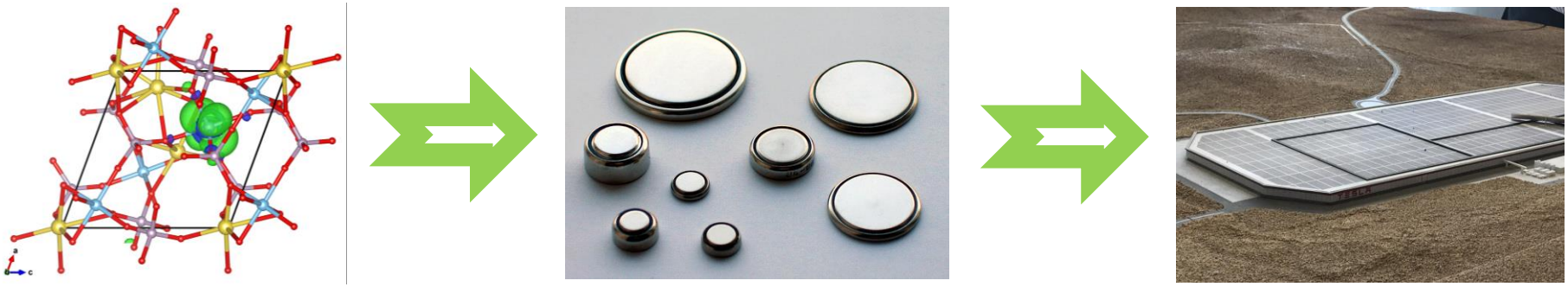
Feasibility and Limits of Aqueous Electrochemical Energy Storage Technologies relating to Sustainability, Safety and Scalable Manufacturing

Aqueous Na-ion batteries for Stationary Energy Storage:

Sustainable manufacturing and life-cycle Safe non-flammable, non-toxic components
Durable: 10+ yrs at 100% DoD cycles Clean: only disposable and recyclable components
Low cost materials and components Scalable design and manufacturing

Challenges:

- **Materials research:** search and optimize novel Na-ion battery materials primary based on abundant phosphate (e.g. NASICONs) or other frameworks.
- **Materials engineering:** develop novel electrode compositions and architectures with superior ionic and electronic conductivity.
- **Electrochemistry:** develop novel stable electrode/electrolyte interfaces suitable for extended lifetime.
- **Electrochemical engineering:** develop novel cell designs and production processes suitable for scalable cell manufacturing and sustainable recycling for aqueous battery components and cells.
- **Electrical engineering:** develop cell-to-system integration and testing processes for aqueous Na-ion batteries.



Project idea No.1:
Feasibility and Limits of Aqueous Electrochemical Energy Storage Technologies relating to Sustainability, Safety and Scalable Manufacturing

Profile / role of partners sought:

R & D Centers

- Ceramics design and processing
- Pilot scale materials processing and production
- Pilot scale battery cell preparation and assembly (focus experience in LFP, LTO)
- Large scale electrochemical cell testing

SMEs

- Cell-to-system design integration and testing
- Out-of-lab system testing and deployment

Targeted EU calls / Deadlines

- FETPROACT-04-2019 Community building and roadmapping for high performance and smart electrochemical energy storage (CSA) / 06 November 2018
- LC-BAT-2-2019 Strengthening EU materials technologies for non-automotive battery storage (RIA) / 25 April 2019
- LC-NMBP-32-2019 Smart materials, systems and structures for energy harvesting (RIA) / 22 January 2019
- LC-SC3-ES-6-2019 Research on advanced tools and technological development (RIA) / 05 February 2019
- H2020-FETOPEN-2018-2020 Novel Ideas for Radically New Technologies / Cut-off dates: 08 October 2019, 14 October 2020

Project idea No.2:
Hydrogen Generation via Overall Electrolytic Splitting of Saline Water

Concept of the project idea:

- Exploitation of vastly abundant saline water for electrolytic generation of H_2

  Overall water splitting ≡ splitting to H_2 + O_2 (no Cl_2, ClO^-!)
- Adapting alkaline electrolyzer – a commercially mature technology – to operate with saline water

Challenges:

- Ensuring selectivity of anode towards oxygen evolution versus chlorine evolution reaction
- Ensuring corrosion resistance of anode and the whole electrolyzer in chloride medium
- Ensuring the activity of cathode during electrolysis with natural seawater
- Disposal and recycling of brine solutions after electrolysis

Value proposition and impact:

- no need for infrastructure of Cl_2 (ClO^-) storage and handling
- no need for expensive desalination technologies
- PV-electricity + alkaline electrolysis of saline water → sustainable, carbon neutral way of H_2 production

Project idea No.2:
Hydrogen Generation via Overall Electrolytic Splitting of Saline Water

Profile / role of partners sought:

R & D Centers :

- Pilot scale materials processing and production
- Large scale electrolyzer testing

SMEs:

- Manufacturers of alkaline electrolyzers / testing of the electrodes and electrolyzer performance with saline water
- Manufacturers with industrial spray-pyrolysis deposition equipment / development of electrode fabrication techniques
- Out-of-lab system testing

Targeted EU calls / Deadlines

- LC-NMBP-29-2019: Materials for non-battery based energy storage / 22 January 2019
- SC5-09-2018-2019: New solutions for the sustainable production of raw materials / 19 February 2019

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Contact details for project idea No.1:

Dr. Linas Vilčiauskas
Center for Physical Sciences and Technology
Saulėtekio al. 3, LT-10257 Vilnius, Lithuania

Phone: +370-5-223-4611

Linas.Vilciauskas@ftmc.lt

Contact details for project idea No.2:

Dr. Jurga Juodkazytė
Center for Physical Sciences and Technology
Saulėtekio al. 3 LT-10257 Vilnius, Lithuania

Phone: +370-5-264-9364

jurga.juodkazyte@ftmc.lt