MaBIC 19

Metal advanced Batteries International Congress

6-7 de noviembre del 2019

Hotel 3 Reyes****
en Pamplona

Organiza

albufera Energy Storage

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MaBIC19 Metal advanced Batteries International Congress

IV Metal-advanced Batteries International Congress

6-7 November 2019 – Pamplona

PROGRAM

Hotel 3 Reyes Pamplona

Calle Taconera, 1, 31001 Pamplona, Navarra.

THURSDAY 7th NOVEMBER

ATENEA MICROGRID

Technical visit to the CENER (National Renewable Energy Centre of Spain) industrial application microgrid scheduled for Thursday 7th November at 9:30 a.m. (Shuttle Bus at 8:30h from Hotel 3 Reyes)

WEDNESDAY 6th NOVEMBER

9:00h Check-in

9:30h Inauguration
Joaquín Chacón, CEO of Albufera Energy Storage and President of MaBIC
Richard Wills, Chairman of MaBIC Scientific Council

10:00h Lorena Alcaraz - CarE-Service Project: a new concept on electric vehicle circular economy and batteries recycling

10:25h Paloma Almodóvar - Al-ion Batteries: Moving toward commercialization

10:55h Coffee-Break

11:30h Alberto Blázquez - Towards the development of a high specific energy and power system: zinc-air/silver hybrid battery

11:55h Elena Iruin - Air electrode development for zinc-air batteries with aqueous-chloride electrolytes

12:20h Joaquín Chacón, Albufera Energy Storage - "Batteries Europe: Activities in WG1 for new and emerging battery technologies"

13:00h Morning Networking Session

13:30h Launcheon

15:00h Alessandro Brilloni - Challenges in the Development of Next-Generation Lithium Batteries: The New High-Energy Semi-Solid Lithium/Oxygen Flow Battery

15:25h Richard Wills - High Power Density electrodes for Aluminium Ion Batteries

15:50h Keynote Speaker - Raquel Ferret, CIC Energigune, "BatteryPlat Initiative, part of the European Battery revolution"

16:20h Afternoon Networking Session

16:50h David Fuchs - Cell design and viscosity: Critical parameters for mechanical recharge

17:15h Josefa Salgado - Ionogels based on ionic liquids as potential battery electrolytes

17:40h Closing Ceremony

Scientific Council

- Dr. Joaquín Chacón, CEO - Albufera Energy Storage.
- Dr. Richard Wills, University of Southampton. Lecturer – Electrochemical Energy Storage. Faculty of Engineering and the Environment University of Southampton.
- Dr. *Francesca Soavi, Assistant professor, Department of Chemistry "Giacomo Ciamician", Bologna University.*
- *Dr. Silvia Bodoardo, Professor of Chemistry at Politecnico di Torino and BATTERY 2030+ Coordinator.*
- *Dr. Mª Luisa López García, Professor and Department Head of Inorganic Chemistry at Universidad Complutense de Madrid.*

CONCLUSION

The 2019 edition of the MaBIC series took place on the 6th and 7th November. It contained eleven oral presentations, a poster session, networking sessions and a site visit to the National Renewable Energy Centre of Spain (CENER) microgrid. The oral presentations were of an extremely high standard and included topics ranging from new electrode and electrolyte materials to the European battery landscape and opportunities. In between, mathematical modelling, cell components, devices and commercialisation were all covered. Novel approaches to existing battery technologies, such as flowing lithium chemistries highlighted the opportunities presented by recent advances in materials and manufacturing in developing new energy storage systems. The breadth of battery chemistries being developed in Europe was evidenced by discussions on aluminium, lithium, zinc as charge storage materials along with aqueous, ionic liquid, organic electrolytes. The Scientific Council noted that the networking discussions appeared fruitful with several delegates commenting that they had started discussions on collaborations.

The scientific council shortlisted five posters for the ISE sponsored prize. The posters included:

- equivalence circuit modelling and AC-impedance analysis of Zn-air batteries;
- characterisation of ionic liquids for lithium ion batteries;
- novel electrode architectures for lithium-air cells;
- electrochemical studies of MnO2 electrodes for lithium and zinc ion batteries;
- characterisation of iron-air electrodes.

Assessing the research context, descriptive text, results, conclusions, overall presentation of material and the potential impact for the battery community the best poster was awarded to Pablo Vallet (Universidade de Santiago de Compostela, Spain): Thermophysical and electrical properties of ethylimidazolium nitrate doped with lithium salt for its use in electrochemical applications

Thermophysical and electrical properties of ethylimidazolium nitrate doped with lithium salt for its use in electrochemical applications

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ABSTRACT

The increasing demand for batteries has led industry and academy to focus on improving the performance, safety and cost of lithium battery technology. A way to improve the safety is to replace the flammable electrolytes used in nowadays batteries with non-flammable compounds, as for example ionic liquids (ILs) doped with inorganic salts containing relevant metals for this electrochemical application [1,2].

ILs are nanostructured green compounds considered as a new class of solvents, whose properties can be appropriately tuned choosing combination of cation and anion from the large number of currently known IL moieties (designer solvents).

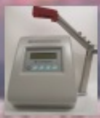
In this work, the operation temperature range, the density, speed of sound and electrical conductivity of the IL ethylimidazolium nitrate doped with different amount of lithium nitrate salt were studied.

EQUIPMENT

DSC/TGA1
Mettler Toledo

DSC Q100
TA Instruments

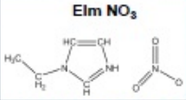
DSA 5000
Anton Paar



GLP 31
Crison

MATERIALS

Elm NO_3



Cas number: 501693-38-5

Elm NO_3 + $LiNO_3$	Molality /$mol_{salt} \cdot kg_{EimNO3}^{-1}$	Pure salt mass /g
PURE	---	---
Li 0.5 m	0.5	3.5
Li 1 m	1	6.89
Li 3m	3	20.68

Table 1: Molality of the studied samples and mass of pure metal salts per 100 g of pure IL .

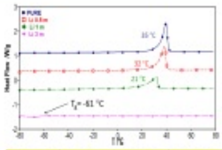


Figure 1. DSC (endo up) profile comparison on heating ramp (5 °C·min^{-1}) for pure ElmNO$_3$ and the three metal salt solutions.

Sample	T_f/°C	T_m/°C	T_g/°C
PURE	-20	35	--
Li 0.5 m	16	32	--
Li 1 m	-3	21	--
Li 3m	--	--	-61

Table 2: Transition temperatures obtained from cooling-heating DSC curves

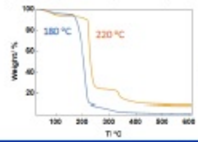


Figure 2. TGA (10 °C·min^{-1}) curves of pure Elm NO_3 and the highest salt solution molality.

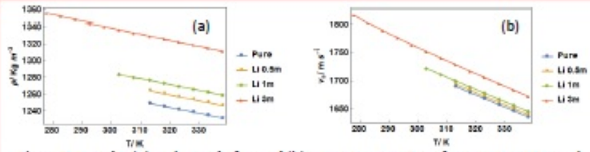


Figure 3. Density (a) and speed of sound (b) versus temperature for pure Elm NO_3 and for the selected three metal salt solutions.

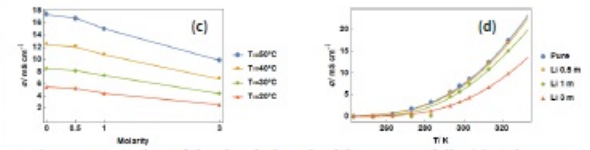


Figure 4. Comparison of the electrical conductivity versus molality (c), and versus temperature (d) for pure Elm NO_3 and for the selected three metal salt solutions (lines in figure (d) correspond to the fitting to the VFT equation)

MAIN CONCLUSIONS

- A reduction of crystallinity as the salt concentration increases is observed (Fig. 1 and Fig. 2; Table 2).
- Density and speed of sound decrease with temperature, following polynomic behaviour, and both increase with the salt concentration, whereas ionic conductivity shows the opposite behaviour, increasing with temperature and decreasing with salt addition (Fig. 3 (a)-(c)).
- The temperature dependence of conductivity was found to be well described by the Vogel-Fulcher-Tamman (VFT) equation [3] (Fig. 3(d)):

$$\sigma = \sigma_0 e^{\frac{A}{T-T_0}}$$

where σ_0, A and T_0 are fitting parameters.

- Despite the lower conductivity of these mixtures compared with commercial electrolytes, the improved safety properties make them worthy for further research.

Aknowledgements
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