



SAPIENZA
UNIVERSITÀ DI ROMA



TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA



Roma Tre



UCBM
UNIVERSITÀ CAMPUS BIO-MEDICO DI ROMA



Società
Chimica
Italiana



**4th National Meeting
Division of Chemistry for Technologies
Italian Chemical Society**

**Roma Tre University
Department of Industrial, Electronic, and Mechanical Engineering
Via Vito Volterra 62, 00146 Rome
June 16-19, 2026**

Book of Abstracts

The challenge of recycling spent lithium-ion batteries: an academy-industry joint project

M. Magni,^{1,*} A. Safdari,¹ S. Ghezzi,¹ K. Rajagopalan,¹ G. Cassardo,¹ G. Riva,¹
D. Maggioni,² P. Roustazadeh,^{1,3} A. Grassi,³ C. Bacco³

¹ *Dipartimento di Scienze e Politiche Ambientali, Università degli Studi di Milano, 20133, Milano*

² *Dipartimento di Chimica, Università degli Studi di Milano, 20133, Milano*

³ *Engitec Technologies SpA, 20026, Novate Milanese (MI)*

*mirko.magni@unimi.it

Lithium-Ion Batteries (LIBs) are ubiquitous electrochemical devices that span from portable electronics to electric vehicles. The tight dependence of this technology from many critical materials is forcing the scientific and industrial community to find out effective strategies to recover such materials from the constantly increasing numbers of spent devices. Looking at the stringent recovery rates stated in the specific Regulation, EU urgently needs efficient and (economically) sustainable hydrometallurgical processes for facing LIBs recycling issue.

Despite the relatively simple working principle, the lack of standards in LIBs manufacturing entails challenges for the recycling processes, especially for post-consumer devices that exhibit plenty of often-unknown features (crafting process, cathode and anode chemistries, shapes and dimensions, etc.). Thus, the development of a robust multi-step and adaptive process capable of running with LIBs of many types seems to be the most effective strategy.

The present research aims at developing an industrially relevant closed-loop hydrometallurgy process for LIBs recycling through a fruitful collaboration with the engineering company Engitec Technologies, partner of the Consortium of the European Battery Innovation project (IPCEI Batterie 2). The process starts with pre-treatment units that include mechanical operations, sorting/separation steps and chemical treatments aimed at recovering bigger metal parts, solvent, Li-based electrolyte, binders, etc. Then, the out coming black mass enters the real hydrometallurgical process aimed at the dissolution of metal oxides from positive electrodes (*i.e.*, leaching stage) followed by the recovery of the metal cations by precipitation, separation, refining, etc.

The speech will then focus on some of the operative units of the process line that represent open scientific challenges. By discussing the results, coming from a 4-years experimentation, the talk will show the multidisciplinary expertise required to carry out the research with the aim of triggering collaborative networking to better facing the big technological challenge behind the LIBs recycling issue.

Acknowledgements

Thanks to FSE-REACT-EU PON “Ricerca e Innovazione” 2014-2020 and Engitec Technologies SpA for co-funding M.M.’s researcher position in the period 2022-24.