


Contribution ID: **42** Type: **Oral Presentation**

# Insights into the aluminium graphite dual-ion battery by synchrotron-based techniques

*Wednesday, November 29, 2023 9:30 AM (30 minutes)*

Renewable energy production is characterised by intermittent power output and requires large-scale applications to improve energy storage capability (currently, less than 1% of the electrical energy production can be stored). Developing low-cost and environmentally friendly electrochemical storage systems characterised by high performance is of fundamental importance for a sustainable energy economy. The currently most mature battery technology is the lithium-ion battery, considered one of the most appealing candidates as a power source for electric vehicle applications. However, the large-scale application of lithium-ion batteries is currently under discussion due to the limited lithium and certain transition metals such as Co and Ni resources. Several other metallic anodic materials such as sodium, potassium, calcium, magnesium and aluminium [1–4], characterised by a higher abundance of lithium, have been considered suitable candidates for electrochemical storage devices in replacing lithium systems. Notably, significant efforts are being devoted to understanding and addressing key challenges in developing these so-called "beyond Li-ion"chemistries, and substantial insights into their storage and failure mechanisms have been obtained over the past few years thanks to advanced characterisation and computation/modelling techniques. An insight into the aluminium graphite dual-ion battery reaction mechanism obtained through advanced operando synchrotron-based techniques will be reported.[5–8]

Acknowledgements

Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.3 - Call for tender No. 1561 of 11.10.2022 of Ministero dell'Università e della Ricerca (MUR); funded by the European Union –NextGenerationEU Award Number: Project code PE0000021, Concession Decree No. 1561 of 11.10.2022 adopted by Ministero dell'Università e della Ricerca (MUR), CUP - E13C22001890001, according to attachment E of Decree No. 1561/2022, Project title "Network 4 Energy Sustainable Transition –NEST"

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