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REALSEI: opeRando chEmical spAce- and time-resoLved quantification of Solid Electrolyte Interphase in hard carbon anode for sustainable sodium-ion batteries

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The goal of the REALSEI project (MSCA-IF-2020) is to visualize for the first time in real-time the Solid Electrolyte Interphase formation at the hard-carbon (HC) anode in a Na-ion battery (NIB). Local electrochemical processes occurring at the solid-liquid interface of Na-ion batteries are currently largely unexplored. To keep global warming around 2.7℃ by 2100, the installed global grid energy storage capacity needs to be tripled by 2050. A technological breakthrough is required to meet this challenge: we need a low cost and sustainable alternative to Li-ion batteries. Thanks to recent advances, the so-called 'beyond-lithium'batteries (BLB) such as K+ and Na+ based systems could be an everyday reality. Bio-waste mesoporous hard carbon (BHC) is one of the most promising anode materials as a universal ion host for BLBs. The use of BHC as a low-cost and recycled solution in BLBs might provide the breakthrough required and give rise to the next generation of batteries. However, uncontrolled SEI formation limits the large-scale application of BHC in BLBs, in particular for Na-ion batteries (NIBs), the most mature and promising. For NIBs, the SEI is still an unresolved issue that limits its long-term stability.
REALSEI established a comprehensive operando time- and space- resolved characterization methodology to transit from bulk (transmission mode) to surface analytical characterization (grazing incidence mode) based on lab and synchrotron high-resolution X-ray techniques which resulted for the first time in a comprehensive visualization and quantification of the species forming the SEI in real-time on HC. REALSEI will apply principles of physics and electrochemistry and its results have substantial scientific, technological, and societal impact.

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