



CYCLE DE CONFÉRENCES

Séminaire général de physique de l'Institut Polytechnique de Paris  
Département de physique de l'École polytechnique

# MATERIALS ADVANCES FOR BETTER Li(Na)-ION BATTERIES: ANY INTEREST TO PHYSICISTS ?



par Jean-Marie TARASCON

Professeur au Collège de France  
Chaire Chimie du solide et énergie

Rechargeable lithium ion batteries, because of their high energy density, have conquered most of today's portable electronics and they stand as serious contenders for electrical vehicles and grid applications. Therefore, for this to happen, materials with higher energy densities while being sustainable, scalable, reliable and low cost must be developed. The challenges for chemists are enormous and this calls for new materials, new chemistries and new concepts. These different aspects will be addressed through this presentation while showing the physics these compounds may exhibit.

Firstly, the strategy towards the design of novel high voltage polyanionic

compounds will be described and their magnetic properties presented. Turning to new concepts, we will show how the discovery of a reversible Li-driven anionic redox process among Li-rich layered oxides represents a transformational approach for creating advanced energy electrode materials while bringing back to the scene ligand holes issues in solids; a fertile ground for superconductivity. To address sustainability aspects, our new findings regarding Na-ion chemistry, which enlists novel materials design, will be shared as well. Lastly, future research directions aiming to inject smartness into batteries via the use of optical sensors together with the development of self-healing approaches will be presented.

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