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Biography

Patrice Simon is Distinguished Professor of Material Science at Université Paul Sabatier. His research focuses on the mechanistic understanding of the charge storage processes at electrode – electrolyte interface using electrochemical techniques. Former director of the Alistore European Research Institute (www.alistore.eu) focused on Li-ion battery research, he currently serves as Deputy Director of the French network on Electrochemical Energy Storage (RS2E, www.energie-rs2e.com).

Patrice Simon is member of the French Academy of Sciences (2019), French Academy of Technologies (2018), Senior Member of the Institut Universitaire de France (2017) and received several awards for his work.

Electrochemistry at the nanoscale:

2- and 3-Dimensional electrodes for energy storage applications

Important performance improvement in Electrochemical Capacitors (ECs) have been achieved in the past years thanks to the design of porous carbons and electrolytes with tailored properties. However, although ECs are now used in several applications including for the ever-growing electric mobility market (trams and hybrid electric vehicles), their main challenge lies in the improvement of their energy density and this is why high-rate performance materials using fast redox reactions are extensively investigated in the literature.

This presentation will give an overview of the research work achieved on capacitive (porous carbon) and high-rate redox materials and the challenges/limitations associated with the development of these materials [1,2]. Starting with porous carbons, we will present the state-of-the-art of the fundamental of ion adsorption mechanism in porous carbons and its practical applications [3]. Moving from double layer to high-rate battery materials, we will show how the control of their structure can help in preparing high power and high energy electrodes using newly developed 2-Dimensional MXene materials [4,5].

References

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