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Editorial

Batteries and Supercapacitors Aging

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Electrochemical energy storage is a key element of systems in a wide range of sectors, such as electro-mobility, portable devices, or renewable energy. Energy storage systems (ESS) considered here are batteries, supercapacitors or hybrid components such as lithium-ion capacitors. The durability of ESS determines the total cost of ownership and the global impacts (lifecycle) on a large portion of these applications and thus their viability. Understanding of ESS aging is a key issue to optimize their design and usage towards their applications. Knowledge of the ESS aging is also essential to improve their dependability (reliability, availability, maintainability and safety).

In the call for contributions for this Special Issue, we were looking for contributions helping to understand aging mechanisms, modes and factors, to perform ESS diagnosis and prognosis and innovative solutions to prolong their lifespans.

Topics of interest include, but are not limited to:

- Innovative measurement techniques of ESS aging;
- ESS aging modeling;
- ESS state-of-health (SOH) estimation;
- ESS prognostic and health management;
- Balancing circuits with consideration of the lifetime of ESS;
- Energy management laws taking into account aging;
- Influence of aging on cost and environmental analyses of ESS;
- Multi-objective optimization strategies of ESS including aging consideration;
- Optimal sizing and design of ESS.

In response to this call of papers, 12 research papers [1–12] and one review article [13] from seven different countries have been published. Researchers from academic institutions from France [1,3–7,9], Germany [2,9,10,12,13], United States [8,11], Russia [4], Spain [9], Belgium [9] and Ethiopia [13] participated, sometimes in collaboration with industrial partners of energy or automotive sectors.

The dominant energy storage technology treated in this special issue is without a doubt lithium-ion batteries [1,2,4–10,13]. However, other technologies are of interest as for example supercapacitors [2] or NiCd batteries [12] and the emerging technology of Lithium-ion capacitors [3,11].

Experiments are a very important part of ESS aging studies and most of the papers in this Special Issue included experimental results [2,3,5–12]. Among the different experimental techniques used to measure and detect aging mechanisms taking place in ESS, special attention can be given to Impedance Spectroscopy [2,10,12] and Incremental Capacity [6–8] techniques.

Finally, all of the contributions show that the aging of electrical energy storage systems remains a major problem. It must be studied to improve the dependability of these systems.

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Conflicts of Interest: The authors declare no conflict of interest.

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