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BATTERIES & SUPERCAPS
Cover Profile

Interphases in Electroactive Suspension Systems: Where Chemistry Meets Mesoscale Physics

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Invited for this month's cover picture the group of Prof. Alejandro A. Franco from LRCS, Amiens, France. The cover picture shows a semisolid redox flow battery set against a background depicting the degree of complexity within the system. Read the full text of the review at 10.1002/batt.201800152.

How would you describe the type of battery addressed in this review?

Semi-solid redox flow batteries (SSRFBs) represent a technological marriage between lithium ion batteries (for portable applications) and redox flow batteries (for large scale applications). Solid material used in lithium ion batteries is suspended in an electrolyte to create a particle suspension which is pumped through a redox flow battery. This battery is fascinating because it is highly complex, especially since rheology becomes as important as electrochemical behavior, opening doors to a lot of new fundamental understanding.

How does this review add value to the scientific community?

The essential message behind this review is that it is risky to take theories, like empirical equations, for granted when applying them to new systems. Simply acknowledging that reality is far more complex than what we can prove experimentally or model, can allow scientists to reevaluate which assumptions are holding their research back or misguiding them. If important information can be extracted from so-called 'failed studies', the state of the art of knowledge can continue to grow and there will be less dead-ends at the invention stage.

What is the story behind the cover graphic?

The main idea is to show the functioning of a semi-solid redox flow battery and how complex the system is through the numerous interconnections between phenomena and parameters in the background. The semi-solid electrode, i.e. the dense particle suspension, is pumped into the battery from external tanks and is discharged to provide electrons, i.e. energy. The particle suspension consists of active material which stores lithium ions and electrons, electronically conductive carbon particles, and ionically conductive electrolyte.

How was the idea of the cover picture conceived?

Corresponding author, Alejandro A. Franco, provided the main vision, feedback on the visuals, and helped finance this cover. The artwork is brought to you by a family collaboration: Garima Shukla designed the background that highlights potential complexity within a SSRFB. Her father, Rakesh Shukla, who is a chemical engineer and specializes in designing water treatment plants, re-interpreted the SSRFB design. The 3D visuals of the battery were created by her brother, Udit Shukla, who is studying graphics design and physics. His passion, skill, and creativity are a result of tremendous hard work that he and his family have put in to help him get through mainstream education and help develop high functioning abilities despite being diagnosed with autism at a young age.