

HYDES

Acronym and title	HYDES: High performance supercapacitors based on deep-eutectic solvent electrolytes
Project number	PTDC/EQU-EQU/4893/2021
Start and conclusion date	01/01/2022 to 31/12/2024

VG CoLAB total budget € 121 989.70

Main goal	Development of new supercapacitors using deep-eutectic solvents
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Partners	Charge2C – NewCap LDA Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento
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Today, one of the main society challenges is centered in the efficient use of energy, to reach carbon neutrality and overall improvement of climate resilience. To tackle these goals, the share of renewable energies in the grid is expected to rise significantly, backed by a strong political agenda such as the Paris Agreement and other national and European development goals, which raises new challenges related to grid’s power fluctuation. Hence, innovative solutions for energy storage systems, such as batteries and supercapacitors (SCs), play a key role in efficient energy supply. The HYDES project aims to develop a new class of supercapacitors (SCs) using novel deep eutectic solvent (DESs) as electrolyte.

This unique setup will not only help in enabling high energy density and operation at harsh temperature conditions but will also address serious concerns associated with organic-based electrolytes making it a promising sustainable solution. The project will span from over not only fundamental work, centered in the development of new electrolyte/electrode pairs, but also on the construction of a real-scale SC cell demonstrator. This will be possible due to the complementary skills of the team on fundamental aspects of the electrolyte performance (IST-ID), electrode development (VG CoLAB), prototype development (C2C) and performance testing in a user case scenario (VG CoLAB with the participation of VG CoLAB partner such as EFACEC, and C2C). By the end of the project, we aim to have a sustainable, non-toxic electrolyte technology with a demonstrated environmental benefit and a full working SC cell, demonstrated in a TRL 6 environment, with high energy density capable of replacing state-of-the-art SC in relevant applications such as back-up power in stationary applications. The innovative pathway of the HYDES project is to design a range of new sustainable DESs-based electrolytes and combine them with optimized electrodes (of capacitive and/or redox nature). Low toxicity/low-cost solid compounds will be used to prepare DESs, liquid at room temperature, by simple routes allowing an easy composition tuning. These innovative DESs will empower different charge storage mechanisms and, in combination with optimized capacitive and redox electrode materials, create synergetic systems with high energy density and low economic and environmental costs. These new systems will allow developments beyond the state-of-the-art, contributing to the fundamental understanding of the characteristics of charge storage mechanisms involved and to technological progress addressing new cell configurations.

Summary