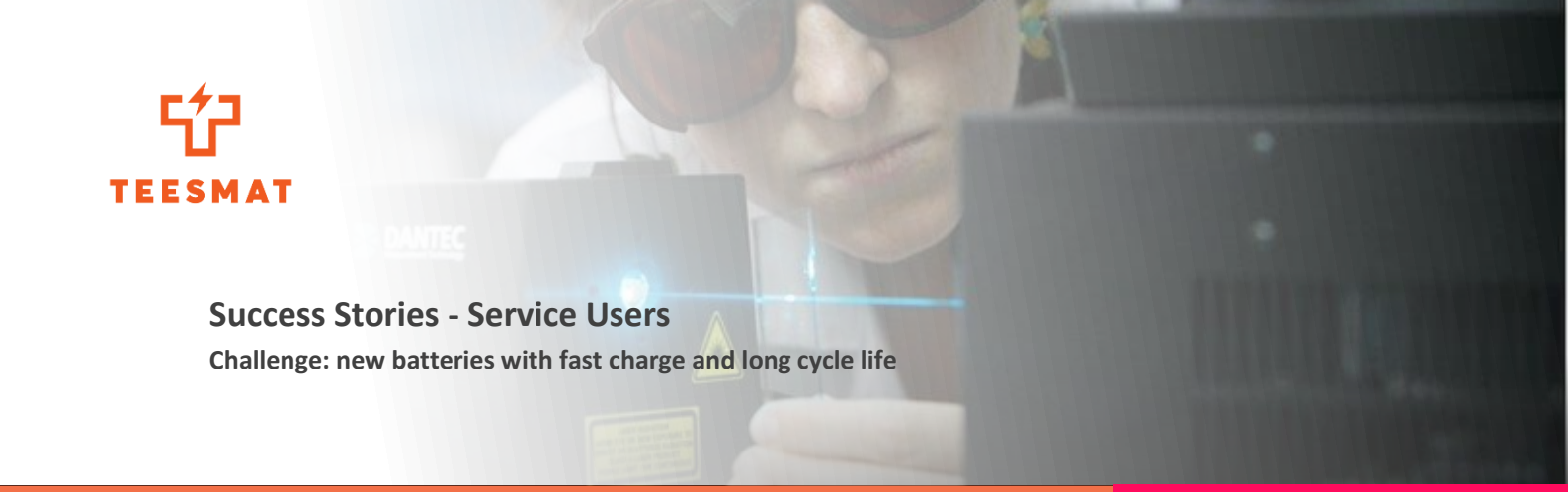

TEESMAT

Success Stories - Service Users

Challenge: new batteries with fast charge and long cycle life

Organisation Profile

YUNASKO-Ukraine LLC (YUN) is a developer of advanced energy storage technologies. The company develops supercapacitors (SC), which are a type of energy storage device with outstanding power and cycle life characteristics far superior to conventional batteries but with a lower energy density. To increase energy, YUNASKO is also developing a hybrid technology, namely, Li-ion batteries (LIB) enhanced by nanoporous carbon. Combining the advantages of both technologies it exhibits ten times higher energy density than SC, and it provides much higher power, longer cycle life and much shorter charging time than classical Li-ion batteries. Contacts: info@yunasko.com

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YUNASKO
PULSE POWER INNOVATIONS

Problem to be solved

The hybrid technology developed by YUNASKO requires a proper combination of SC and LIB ingredients in positive and negative composite electrodes and the electrolyte. Various combinations lead to different electrochemical characteristics of hybrid devices. It is a real challenge to relate those with structural and morphological characteristics of composite electrodes and electrochemical processes occurring in the electrolyte at various life stages of the device.

Solution provided by TEESMAT

TEESMAT partners have provided an accurate description of various processes occurring in the complex hybrid electrochemical systems at different stages of their life cycle. RAMAN spectroscopy (CERTH) allowed the identification of structural changes at the electrode's surface and determined the degree of the crystal lattice distortion. The use of hard X-ray scattering (ESRF) revealed the changes at the electrode interfaces and the crystalline impurities. The X-ray nanotomography technique (ESRF) provided information at the electrode and particle scale by demonstrating mechanical changes such as electrode delamination, film cracking and porosification. Also, the analysis of gas evolution (ZSW) during the cell operation helped to understand better the side reactions occurring with the electrolyte. The thermal signature obtained from heat flux sensors (CEA) of the cell during cycling was analysed to characterise the thermal behaviour of the cell and calculate the thermal properties. Finally, a characterisation technology based on the acoustic emissions measurement (CEA) demonstrated that the evolution of the acoustic signal over cycling is significant and repeatable, making it possible to identify the cell's state of charge independently from the electrochemical parameters.

Impact

YUNASKO has recently been involved in negotiations with some European car producers. The European gigafactory project aims to develop and manufacture the most effective electrochemical energy storage systems to drastically reduce CO_2 generation. The fast charge and long cycle life of hybrid devices are of interest, and this can be further supported by the possible anticipated improvements as a result of TEESMAT project cooperation and studies.

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