The GigaGreen Project. Towards the sustainable giga-factory: developing green cell manufacturing processes

Elisa Ravesio[1], Giorgio Montinaro[1], Daniele Versaci[1], Federico Bella[1], Silvia Bodoardo[1]
[1] *Dip. Applied Science and Technology (DISAT), Politecnico di Torino, C.so Duca degli Abruzzi 24, 10029 Torino, Italy*

Horizon Europe GigaGreen Project [1] aims to develop a greener and more scalable cell production technology aimed to the industrial level following a Design to Manufacture (DtM) approach, with the ultimate goal of making Europe a strategic leader in the Li-ion battery production. In this line, GigaGreen focuses on the increment of the cost-efficiency and safety of processes and products, for example, one of the most important steps of this project is to move from Polyvinylidene Fluoride (PVDF) as binder, which requires the organic, toxic and expensive solvent N-Methyl-2-Pyrrolidone (NMP) to more sustainable and economical water-processable Fluorine-free binders. The importance of this improvement is related to the high costs of electrode processing, from mixing to deposition, which represents nearly 40% of the cell manufacturing costs [2].
The role of Politecnico di Torino (POLITO), coordinator of the GigaGreen project, is to develop a Si/C composite-based wet anode, starting from laboratory scale and scaling up to a small pilot line. In particular, the challenge is to optimize the slurry preparation by studying how the rheological parameters can influence the coating step, in order to maximize the yield production for a promising anode active material. The so obtained anode electrodes present a higher ratio of Si compared to commercial ones and so higher specific capacity can be obtained.
To reach the project goals, an in-depth characterization of the operating parameters of the roll-to-roll coating machine is been carried out in POLITO, producing standard anodes with commercial graphite (Figure 1).
The presentation will show that one of the most critical parameters is the gap imposed between rolls during the slurry deposition: this crucial parameter is directly related to the quantity of active material on the electrode and its final density. The speed of deposition and the oven temperature during the drying process are other parameters that can influence the quality of the slurry having a significant effect on the final product. It is very important to balance all of these parameters so that the overall process can be more energy and cost-efficient than the actual one utilized at industrial level.

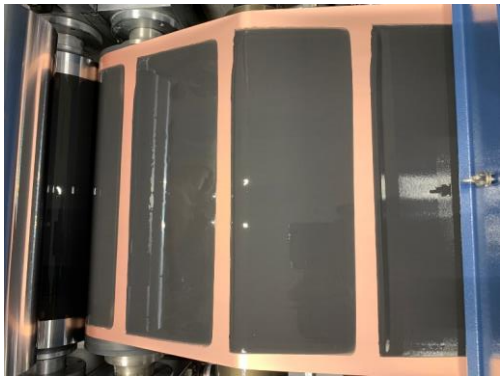

Figure 1 – Anode coating on roll-to-roll machine

REFERENCES

[1] https://www.gigagreenproject.eu
[2] Küpper D, et al. The Boston Consulting Group, The Future of Battery Production for Electric Vehicles, 2018.

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