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SOLVENT-FREE ELECTRODE MANUFACTURING FOR LI-ION BATTERIES TOWARDS DEVELOPING A CONTINUOUS PROCESS

MOTIVATION

- Increasing sustainability is possible by water based [1] or solvent-free manufacturing
- Avoiding time and energy consuming drying step
- No explosion proof layout or solvent recovery necessary

Main advantages

Reducing overall battery manufacturing costs: - 14.5 % [2]

Decreasing energy usage per kWh capacity: - 42 kWh/kWh [3]

HIGHLIGHTS

- Innovative solvent-free manufacturing process for cathodes developed
- Electrochemical results of dry processed cathodes in coin cells and pouch cells
- Comparable electrochemical performance to NMP based cathodes manufactured on AIT pilot equipment

EQUIPMENT AND R2R MANUFACTURING

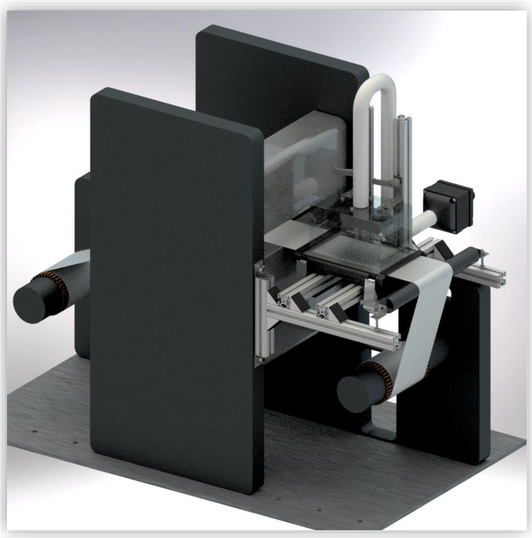

Figure 1: R2R calender with self developed dry coating device at AIT pilot line facilities [4]

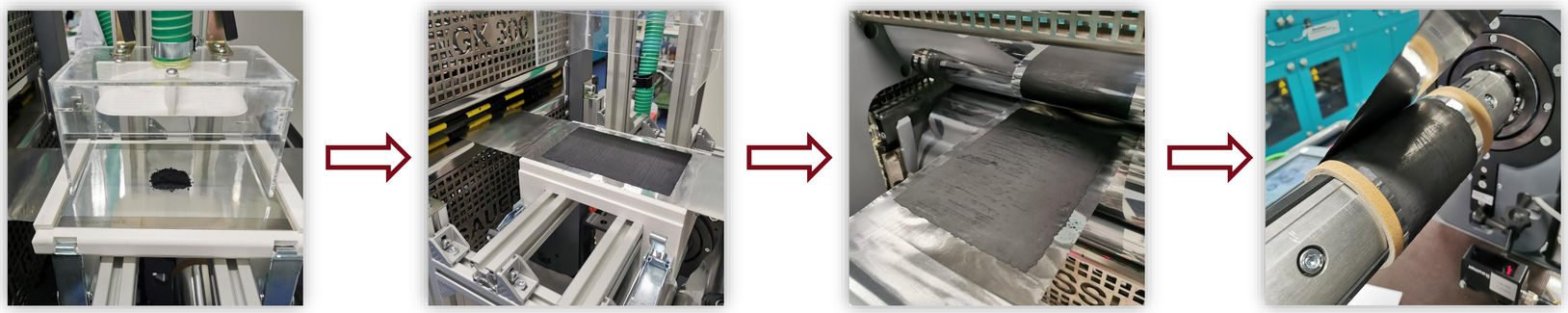

Figure 2: Solvent-free manufacturing process at AIT pilot line facilities [4]

FORMULATION	DRY COATING	CALENDERING	COIL UP
NMC 622, PVDF, CB (90:6:4 wt%)	Pre-compact ~ 300 to 550 µm	Compression ratio of ~ 3	ø 86 mm
Ball milling	Area 160 mm x 100 mm	150 °C rolling temperature	4.0 mAh/cm² to 6.9 mAh/cm²

RESULTS & DISCUSSION

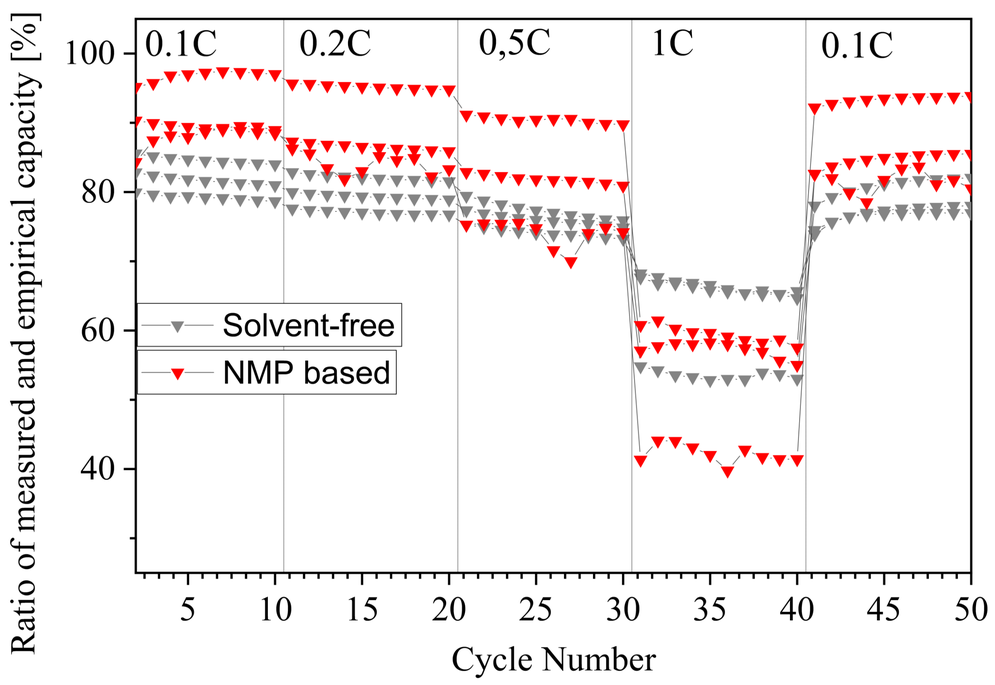

Figure 4: CCCV rate capability test at C/10, C/5, C/2 and 1C for 3.0 - 4.2 V of solvent-free cathodes and NMP based cathodes in coin cells, same anode (graphite), EC:EMC (3:7) + 2 wt% VC [4]

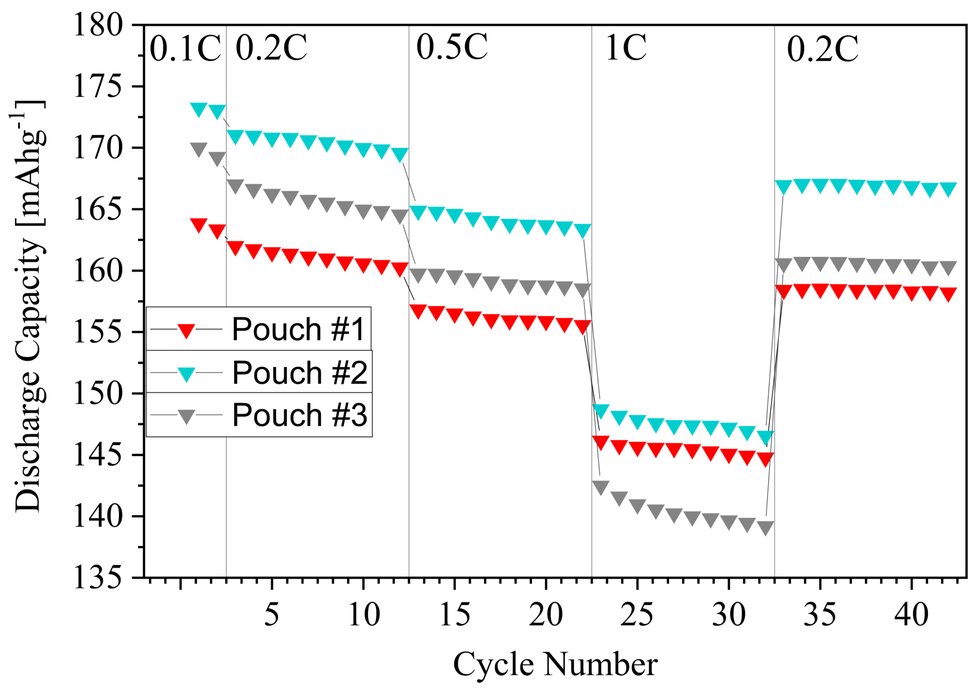

Figure 5: CCCV rate capability test at C/5, C/2 and 1C for 3.0 - 4.2 V of solvent-free cathodes in pouch cells, full cell with 260 mAh, EC:EMC (3:7) + 2 wt% VC [4]

- ~ 10 % reduced discharge capacities compared to NMP based cathodes
- Similar rate capability and capacity retention behaviour compared to NMP based cathodes
- NMC 622, 4 mAh/cm² cathodes achieved 160 mAh/g at 0.5 C in pouch cells

CONCLUSION AND OUTLOOK

- Successful solvent-free R2R manufacturing process
- Electrochemical results shown in pouch and coin cells
- Usability for different active materials to be proven

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Please contact me for any follow-up information!
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