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18. abstract The RecyLIB project aimed to develop a process chain for the manufacturing and direct recycling of lithium-ion batteries. Initially, cathodes were produced using fresh LiFePO4 (LFP) and LiNi0.6Co0.2Mn0.2O2 (NCM622) through a PFAS-free melt electrode manufacturing process. After assembly and electrochemical aging of these cathodes, it was found that the specific discharge capacity of the cells with RecyLIB cathodes was comparable to that of conventionally processed cathodes. The aged RecyLIB cells were used to develop a direct recycling process, where the cells were first opened using shock wave technology. Characterization of the resulting black mass showed successful pre-concentration into cathode-rich and anode-rich fractions. For further purification, centrifugation and heavy liquids were employed. A hydrothermal treatment in a lithium-rich solution successfully regenerated the cathode materials. Recycled and regenerated materials were reintegrated into new electrodes, with cells containing up to 25 weight-% regenerated material achieving over 90% of the capacity of cells containing 100% fresh material.	
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