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18. abstract The EmboPlate joint project aimed to develop and comprehensively characterise innovative graphite materials for central functional components of redox flow battery stacks - in particular bipolar plates (BPP) and monopolar plates (MPP). The focus was on reducing the specific investment costs by increasing the current density and specifically improving the electrochemical and mechanical properties of these components. Highly conductive composite plates based on graphite-polymer systems were developed for the BPP, into which structures were integrated for optimised electrolyte routing. This structuring led to a more even flow, lower pressure losses and improved utilisation of the active reaction surface. An innovative flow-by architecture was successfully developed, simulated and validated through experimental investigations. At the same time, a fluorine-free graphite formulation was developed that demonstrated high electrochemical stability in long-term operation in vanadium redox flow systems, while at the same time exhibiting comparable electrical conductivity to established materials. The mechanical integrity and impermeability of the plates in multi-cell format were successfully demonstrated under realistic operating conditions. An alternative concept was pursued for the MPP: the use of a fully graphitic plate without additional metallic current collectors, which significantly minimised the risk of metal-induced electrolyte contamination. The electrical resistance was minimised through targeted material and contact optimisation. Overall, EmboPlate represents a scalable, technologically robust basis for the development of cost-efficient and powerful redox flow battery systems that can play a central role in the integration of renewable energies into future energy infrastructures.	
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