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Water in Lithium-Ion Batteries

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Preface

Water (H_2O) in lithium-ion batteries (LIBs), which are constructed with anodes, cathodes and organic electrolytes that contain lithium salts, can degrade the cell performance and seriously damage the materials. However, because a small amount of H_2O in cells contributes to the formation of a solid electrolyte interphase (SEI), the complete removal of H_2O from cells lowers battery performance and increases the expense of H_2O removal from the battery materials. The optimal concentration of H_2O for each battery material has been determined, and these concentrations are maintained with appropriate removal methods and H_2O scavengers that were recently developed to establish both high performance and low cost. More recently, to achieve both the safety and low cost of LIBs, the development of anode and cathode preparations by aqueous processes and aqueous LIBs in which aqueous electrolytes containing lithium salts are used as electrolytes has progressed. In this review, information on the H_2O content in LIBs, the reactivity of anodes, cathodes and electrolytes with water and the processes underlying H_2O resistance in LIB materials is reviewed from the perspective of H_2O concentration and LIB stability. The goal of this review is to provide appropriate information concerning the amount of H_2O needed in cells to achieve stable and high cell performance.

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