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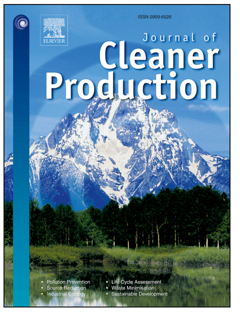

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Providing a common base for life cycle assessments of Li-Ion batteries

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Abstract

Numerous studies exist on the environmental impact of Li-Ion battery (LIB) production. Nevertheless, these studies use different impact assessment methods and different approaches for modelling key aspects like energy demand for cell manufacturing or the composition of the cell package. Since the outcomes of the studies are highly sensitive on these aspects, a direct comparison of the corresponding results is not possible. However, a robust comparative analysis would be of high interest for evaluating the actual environmental performance of different alternative battery chemistries. Based on a review of existing LCA studies on LIB production, the corresponding discrepancies in the modelling of these key aspects are pointed out and their impact on the outcomes of the underlying studies is highlighted. The existing primary life cycle inventory data (LCI) for the principle LIB chemistries are then recompiled and common average values implemented for the identified key parameters. In this way, the environmental impacts associated with the production of different battery chemistries are assessed on a common base. This provides an improved comparability between studies and allows for a tentative technology benchmarking of different Li-Ion battery chemistries. It can be observed that the different assumptions and modelling approaches for the mentioned key aspects can have a stronger impact on the final results than the battery chemistry itself. Especially the approach for modelling the cell manufacturing energy demand, but also for the electrode binder and the battery management system influence the results significantly. Thus, putting existing LCA studies on a common base is essential for battery technology benchmarking and avoids erroneous conclusions when comparing the environmental impacts associated with the production of different Li-Ion battery chemistries.