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A Functional Thermochemical Energy Storage System for Mobile Applications: Design and Performance Analysis

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Abstract : Thermochemical energy storage (TCES), as a long-term and lossless energy storage principle, provides a contribution for the reduction of greenhouse emissions of mobile applications, such as passenger vehicles with an internal combustion engine. A prototype of a TCES system, based on reversible sorption reactions of LiBr composite and methanol has been designed at Vienna University of Technology. In this paper, the selection of reactive and inert carrier materials as well as the design of heat exchangers (reactor vessel and evapo-condenser) was reviewed and the cycle stability under real operating conditions was investigated. The performance of the developed system strongly depends on the environmental temperatures, to which the reactor vessel and evapo-condenser are exposed during the phases of thermal conversion. For an integration of the system into mobile applications, the functionality of the designed prototype was proved in numerous conducted cycles whereby no adverse reactions were observed.

Keywords : dynamic applications, LiBr composite, methanol, performance of TCES system, sorption process, thermochemical energy storage
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