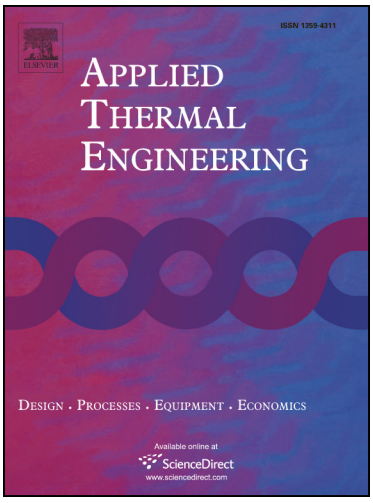

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Performance analysis of a thermal energy storage system based on paired metal hydrides for concentrating solar power plants

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Abstract

Concentrating solar power (CSP) plants require suitable thermal energy storage (TES) systems to enable power generation during the night and cloudy days. Metal hydrides (MH) are attractive options for such TES system and a novel design of an MH-TES system is proposed for CSP plants. A 2D mathematical model is developed to study heat and mass transfer inside this system in which a heat storage medium of high-temperature MH bed (Mg_2FeH_6) is coupled with a low-temperature MH bed (Na_3AlH_6). To simulate this model a numerical code in Fortran-90 is made. The main objective of this work is (i) to demonstrate the technical feasibility of the novel MH-TES system through the simulation of operating cycles, and (ii) to discuss the performance assessment of the proposed system. The process simulation demonstrated a consistent thermal and dynamic coupling between the paired MH beds. The performance analysis showed that the present MH-TES system