SolarInnovate Energy Solutions

Aluminum for energy storage power stations

Overview

Can aluminum be used as energy storage and carrier medium?

To this regard, this study focuses on the use of aluminum as energy storage and carrier medium, offering high volumetric energy density (23.5 kWh L −1), ease to transport and stock (e.g., as ingots), and is neither toxic nor dangerous when stored. In addition, mature production and recycling technologies exist for aluminum.

Can molten aluminum be used in stationary power generation?

Both solid (powder) and molten aluminum are examined for applications in the stationary power generation sector, including the integration of aluminum-based energy storage within aluminum refinement plants. Two innovative aspects are proposed in this work.

Can aluminum be used as energy storage?

Extremely important is also the exploitation of aluminum as energy storage and carrier medium directly in primary batteries, which would result in even higher energy efficiencies. In addition, the stored metal could be integrated in district heating and cooling, using, e.g., water–ammonia heat pumps.

Is aluminum a good ESCM?

Aluminum appears to be a rather interesting ESCM, promising better performance and higher safety than hydrogen 5, 26 for large scale, global multisectoral energy storage. P2X applications would be favored by the high volumetric energy density of aluminum enabling rather easy and low-cost mid- and long-term storage.

Does aluminum outperform power-to-power systems based on hydrogen and liquid fuels?

Along with the additional advantages relating to high volumetric energy density, and safety and management aspects, the aluminum-based

technology appears to outperform the power-to-power systems based on hydrogen and liquid fuels.

How much electricity does aluminum use?

State-of-the-art aluminum production (Hall–Héroult process) consumes about 0.4 kg carbon electrodes, 12.95 kWh of electricity, and 0.4 kg of carbon (from the electrodes) per kg of Al. 33 For the application herein proposed the electric energy consumed, 46.44–46.8 kJ g Al−1 according to the current best practice, 42 must originate from RESs.

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