Shared Pressure Vessel Metal Hydrogen Battery

Related Application

[0001] The present disclosure claims priority to U.S. patent application no. 18/177,602 filed on March 2, 2023, which claims priority to U.S. Provisional Appl. 63/316,591, filed on March 4, 2022, which are herein incorporated by reference in their entirety.

Technical Field

[0002] Embodiments of the present invention are related to metal-hydrogen batteries and, in particular, to shared pressure vessel configurations of metal-hydrogen batteries.

Discussion of Related Art

[0003] For renewable energy resources such as wind and solar to be competitive with traditional fossil fuels, large-scale energy storage systems are needed to mitigate their intrinsic intermittency. To build a large-scale energy storage, the cost and long-term lifetime are the utmost considerations. Currently, pumped-hydroelectric storage dominates the grid energy storage market because it is an inexpensive way to store large quantities of energy over a long period of time (about 50 years), but it is constrained by the lack of suitable sites and the environmental footprint. Other technologies such as compressed air and flywheel energy storage show some different advantages, but their relatively low efficiency and high cost should be significantly improved for grid storage. Rechargeable batteries offer great opportunities to target low-cost, high capacity and highly reliable systems for large-scale energy storage. Improving reliability of rechargeable batteries has become an important issue to realize a large-scale energy storage.

[0004] Consequently, there is a need for better metal-hydrogen battery configurations.

Summary

[0005] In accordance with embodiments of this disclosure a shared pressure vessel metal hydrogen battery is disclosed. According to a first aspect of the present invention, there is provided a metal hydrogen battery including one or more pressure vessels, each of the one or more pressure vessels including one or more electrode stacks, and each of the one or more pressure vessels including a fill tube; a manifold coupled to the fill tube of each of the one or more pressure vessels, the manifold including a control device; and a storage vessel coupled to the control device, wherein hydrogen gas stored in the storage vessel is supplied to the one or more pressure vessels through the manifold and the control device.

[0005a] According to a second aspect of the present invention, there is provided a method of operating a metal hydrogen battery, including: providing hydrogen from a storage vessel to one or more pressure vessels, each of the one or more pressure vessels including one or more

electrode stacks, with a control device coupled between the storage vessel and the one or more pressure vessels.

[0005b] According to a third aspect of the present invention, there is provided a metal hydrogen battery, including: means for providing hydrogen from a storage vessel to one or more pressure vessels, each of the one or more pressure vessels including one or more electrode stacks, with a control device coupled between the storage vessel and the one or more pressure vessels.

[0006] These and other embodiments are discussed below with respect to the following figures.

Brief Description of the Figures

[0007] An understanding of the features and advantages of the technology described in this disclosure will be obtained by reference to the following detailed description that sets forth illustrative aspects with reference to the following figures.

[0008] Figure 1 illustrates an example of a metal-hydrogen battery according to some aspects of the present disclosure.

[0009] Figure 2 illustrates an example of a metal-hydrogen battery with a shared pressure vessel configuration according to some embodiments.

[0010] Figure 3 illustrates another example of a metal-hydrogen battery with a shared pressure vessel configuration according to some embodiments.

[0011] Figure 4 illustrates another example of a metal-hydrogen battery with a shared pressure vessel configuration according to some embodiments.

[0012] These figures are further discussed below.

Detailed Description

[0013] In the following description, specific details are set forth describing some aspects of the present invention. It will be apparent, however, to one skilled in the art that some embodiments may be practiced without some or all of these specific details. The specific embodiments disclosed herein are meant to be illustrative but not limiting. One skilled in the art may realize other elements that, although not specifically described here, are within the scope and the spirit of this disclosure. Such modifications may include substitution of known equivalents for any aspect of the disclosure in order to achieve the same result in substantially the same way.

[0014] Consequently, this description illustrates inventive aspects and embodiments that should not be taken as limiting the claims define the protected invention. Various changes may be made without departing from the spirit and scope of this description and the claims. In some instances, well-known structures and techniques have not been shown or described in