CLAIMS

WHAT IS CLAIMED IS:

[Claim 1]

An energy storage device made of an aluminum electrode, comprising:

a positive electrode;

a negative electrode, wherein the negative electrode is the aluminum electrode and the negative electrode comprises expanded mesh metal;

a separator, disposed between the positive electrode and the negative electrode, wherein the separator comprises polytetrafluoroethylene film; and

an electrolyte, disposed between the positive electrode and the negative electrode and partly located in the separator, wherein the electrolyte comprises an aluminum halide and an ionic liquid, the aluminum halide is configured to undergo an electrochemical reversible adsorption reaction on a surface of the negative electrode and generate an ion, and the ion is ionized through the ionic liquid for storage of intercalated and emigrated charge at the positive electrode during charging.

[Claim 2]

The energy storage device according to claim 1, wherein the positive electrode is formed by coating a nickel foil with an intercalation material.

[Claim 3]

The energy storage device according to claim 2, wherein the intercalation material comprises natural graphite, artificial graphite, a carbon nanotube, graphene, or a transition metal oxide.

[Claim 4]

The energy storage device according to claim 2, wherein the intercalation material has at least

a first-sized particle and a second-sized particle, and the first-sized particle is different from the second-sized particle.

[Claim 5]

The energy storage device according to claim 1, wherein a molar ratio of the aluminum halide to the ionic liquid is greater than at least 1.5.

[Claim 6]

The energy storage device according to claim 1, wherein a moisture content of the electrolyte is less than at least 1,000 ppm.