CLAIMS

[Claim 1]

A method of recovering valuable materials, the method comprising:

a heat treatment step of performing a heat treatment on a lithium-ion secondary battery at a temperature of 660°C or higher to obtain a heat-treated product;

a crushing and classification step of crushing the heat-treated product to obtain a crushed product and classifying the crushed product into a coarse-particle product and a fine-particle product, both including the valuable materials;

a slurry formation step of immersing the fine-particle product in water to form fine-particle product slurry;

a wet magnetic separation step of performing wet magnetic separation on the fine-particle product slurry to separate the fine-particle product slurry into a magnetic material and a non-magnetic material slurry;

an acid leaching step of adding sulfuric acid to the non-magnetic material slurry, or a non-magnetic material obtained by performing solid-liquid separation on the non-magnetic material slurry, or both the non-magnetic material slurry and the non-magnetic material to adjust pH to 0 or greater and 3.5 or less to leach the non-magnetic material, followed by performing solid-liquid separation to obtain an acid leachate and an acid leach residue;

a neutralization step of neutralizing the acid leachate with calcium hydroxide;

a neutralized cake solid-liquid separation step of performing solid-liquid separation on a liquid obtained at the neutralization step;

a calcium carbonate crystallization step of adding CO_2 to a liquid obtained at the neutralized cake solid-liquid separation step;

a calcium carbonate solid-liquid separation step of performing solid-liquid separation on a liquid obtained at the calcium carbonate crystallization step; and

a calcium adsorption and removal step of adsorbing and removing calcium with a chelating resin after the calcium carbonate solid-liquid separation step,

wherein the method of recovering valuable materials is a method of recovering lithium carbonate from the lithium-ion secondary battery, where the lithium carbonate has a boron content of less than 1 ppm and a calcium content of 100 ppm or less, and

wherein an amount of the CO_2 added at the calcium carbonate crystallization step is 0.5 or less in a molar ratio to lithium ions of the liquid obtained at the neutralized cake solid-liquid separation step.

[Claim 2]

The method of recovering valuable materials according to claim 1,

wherein an amount of the CO_2 added at the calcium carbonate crystallization step is 0.1 or greater in a molar ratio to

calcium ions of the liquid obtained at the neutralized cake solid-liquid separation step, and is 0.25 or less in a molar ratio to lithium ions of the liquid obtained at the neutralized cake solid-liquid separation step.

[Claim 3]

The method of recovering valuable materials according to claim 1 or 2,

wherein the chelating resin is an iminodiacetic acid group-containing chelating resin.

[Claim 4]

The method of recovering valuable materials according to claim 1, further comprising:

a first concentration step of concentrating, by electrolysis, lithium included in the liquid obtained at calcium carbonate crystallization step, after the calcium carbonate crystallization step.

[Claim 5]

The method of recovering valuable materials according to claim 1, further comprising:

a second concentration step of performing electrodialysis to concentrate lithium included in a liquid from which calcium is removed through adsorption, after the calcium adsorption and removal step.

[Claim 6]

The method of recovering valuable materials according to claim 4 or 5, further comprising:

a lithium carbonate crystallization step of adding carbonic acid to a concentrate obtained at the first concentration step or the second concentration step to crystallize lithium carbonate.

[Claim 7]

The method of recovering valuable materials according to claim 6,

wherein the lithium carbonate is washed with warm water to obtain lithium carbonate having both a sulfuric acid content and a sodium content of 0.5% by mass or less.

[Claim 8]

The method of recovering valuable materials according to claim 1 or 2,

wherein the lithium carbonate has a potassium content of 50 ppm or less.