process of removing phosphorus using a phosphorus anion remover is essential. This complicates the process of converting Li_3PO_4 into $LiOH \cdot H_2O$ and Li_2CO_3 and causes lithium loss, so there is a problem in that efficiency of the process is reduced.

SUMMARY

The present disclosure is directed to provide a method of extracting lithium from a lithium solution by an economical, efficient, and simple method.

The present disclosure is also directed to provide a method of preparing lithium carbonate or lithium hydroxide from a lithium solution by an economical, efficient, and simple method.

In an aspect, there is provided a method of extracting lithium, comprising:

adding a phosphorus source material to a first solution containing a lithium cation (Li^+) and alkaline earth metal cations to produce a lithium precipitate containing magnesium, calcium, strontium, and phosphorus,

wherein the total concentration of the alkaline earth metal cations in the first solution is 100,000 mg/L or more,

in the first solution, wherein the alkaline earth metal cations comprise a magnesium cation (Mg^{2+}), a calcium cation (Ca^{2+}), and a strontium cation (Sr^{2+}),

the phosphorus source material is included in an amount of 1 mole to 4 moles based on 1 mole of the lithium cation in the first solution,

the lithium precipitate has a lithium dissolution rate of 50% or more, the lithium dissolution rate is calculated according to the following Equation 2:

[Equation 2]

Lithium dissolution rate = A/B x 100

(in Equation 2, B = Total concentration of lithium cation contained in the lithium precipitate (units: mg/L),

A = Total concentration of lithium cation in filtrate obtained by stirring the lithium precipitate in 90 ℃ water in an amount of 15 times the weight of the lithium precipitate for 60 hours and filtering the slurry(units: mg/L)).

In another aspect, there is provided a method of preparing lithium carbonate, comprising using the precipitate of the lithium extraction method as defined above.

In another aspect, there is provided a method of preparing lithium hydroxide, comprising using the precipitate of the lithium extraction method as defined above.

One example of the present disclosure provides a method of extracting lithium.

The method of extracting lithium includes adding a phosphorus source material to a first solution containing a lithium cation (Li^+) and an alkaline earth metal cations to produce a lithium precipitate including magnesium, calcium, and phosphorus, wherein the total concentration of the alkaline earth metal cations in the first solution is 100,000 mg/L or more.

The lithium precipitate may have a lithium dissolution rate of 25% or more, calculated according to the following Equation 2:

[Equation 2]

Lithium dissolution rate = A/B x 100

(in Equation 2, B = Total concentration of lithium cation contained in the lithium precipitate (units: mg/L),

WHAT IS CLAIMED IS:

1. A method of extracting lithium, comprising:

adding a phosphorus source material to a first solution containing a lithium cation (Li^+) and alkaline earth metal cations to produce a lithium precipitate containing magnesium, calcium, strontium, and phosphorus,

wherein the total concentration of the alkaline earth metal cations in the first solution is 100,000 mg/L or more,

in the first solution, wherein the alkaline earth metal cations comprise a magnesium cation (Mg^{2+}), a calcium cation (Ca^{2+}), and a strontium cation (Sr^{2+}),

the phosphorus source material is included in an amount of 1 mole to 4 moles based on 1 mole of the lithium cation in the first solution,

the lithium precipitate has a lithium dissolution rate of 50% or more, the lithium dissolution rate is calculated according to the following Equation 2:

[Equation 2]

Lithium dissolution rate = A/B x 100

(in Equation 2, B = Total concentration of lithium cation contained in the lithium precipitate (units: mg/L),

A = Total concentration of lithium cation in filtrate obtained by stirring the lithium precipitate in 90 °C water in an amount of 15 times the weight of the lithium precipitate for 60 hours and filtering the slurry(units: mg/L)).

2. The method of claim 1, wherein the lithium precipitate has the lithium dissolution rate of 60% or more, calculated according to the following Equation 2.

3. The method of claim 1 or 2, wherein the first solution further contains alkali metal cations.

4. The method of claim 3, wherein the alkali metal cations are one or more of a sodium cation (Na^+) and a potassium cation (K^+).

5. The method of claim 3, wherein the first solution further contains cations or anions derived from one or more of iron, manganese, cobalt, boron, silicon, aluminum, chlorine, and sulfur.

6. The method of any one of claims 1 to 5, wherein the first solution is derived from any one of brine, underground hot water, sea water, a mineral, and a waste battery.

7. The method of any one of claims 1 to 6, wherein the concentration of the lithium cation in the first solution is 70 mg/L or more.

8. The method of any one of claims 1 to 7, wherein the lithium precipitate further contains one or more of sodium, potassium, chlorine, and sulfur.

9. The method of any one of claims 1 to 8, wherein the phosphorus source material is one or more selected from phosphorus, phosphoric acid, a phosphate, a hydrogen-phosphate and a phosphorus-containing solution.

10. The method of any one of claims 1 to 9, wherein the total concentration of the lithium cation (Li^+) and the alkaline earth metal cations in the first solution is 100,100 mg/L or more.

11. The method of any one of claims 1 to 10, wherein the total concentration of the lithium cation, the alkaline earth metal cations, and the alkali metal cations in the first solution exceeds 100,000 mg/L.

12. The method of any one of claims 1 to 11, further comprising adding 80 ℃ to 100 ℃ water in an amount of 5 to 20 times the weight of the lithium precipitate to the lithium precipitate, stirring a slurry of the lithium precipitate for 12 hours to 60 hours and then filtering the slurry to obtain a second solution, wherein the second solution contains the lithium cation.

13. The method of claim 12, wherein the concentration of the lithium cation in the second solution is 200 mg/L or more.

14. The method of claim 12 or 13, further comprising adding 0.1wt% to 5wt% diluted hydrochloric acid in an amount of 5 to 20 times the weight of the lithium precipitate at room-temperature to the lithium precipitate, stirring a slurry of the

lithium precipitate for 1 hour to 5 hours and then filtering to obtain a third solution, wherein the third solution contains the lithium cation.

15. The method of claim 14, wherein the concentration of the lithium cation in the third solution is 200 mg/L or more.

16. The method of claim 12, further comprising preparing lithium hydroxide or lithium carbonate from the second solution.

17. A method of preparing lithium carbonate, comprising using the precipitate of the lithium extraction method according to any one of claims 1 to 16.

18. A method of preparing lithium hydroxide, comprising using the precipitate of the lithium extraction method according to any one of claims 1 to 16.