WO Publication No. 2020/110108 describes a process for the separation and purification of magnesium lactate from a fermentation broth, comprising the steps of:

(a) providing a clarified fermentation broth from which insoluble impurities have been removed comprising magnesium lactate in a soluble form being the result of a fermentation process, the fermentation broth being at a temperature of about 45°C to about 75°C;

(b) concentrating the clarified broth from step (a) to a concentration of about 150 g/L to about 220 g/L of lactate;

(c) performing at least one cooling crystallization of the concentrated clarified broth from step (b) to obtain magnesium lactate crystals; and

(d) collecting the magnesium lactate crystals obtained.

There remains an unmet need for simple, cost-effective methods with high recovery yields for the crystallization of high purity magnesium L-lactate salt from decomposed organic waste.

SUMMARY ~~OF THE INVENTION~~

The present ~~invention~~disclosure provides a process for preparing high-purity magnesium L-lactate from fermentation broths or other organic waste decomposition products containing lactic acid and/or lactate salts. The process of the present ~~invention~~disclosure comprises evaporative crystallization which can utilize fermentation broths or other organic waste decomposition products from diverse origins thereby rendering the process both economically and environmentally beneficial. The process disclosed herein is suitable for fed batch production as well as continuous production in lactic acid recycling facilities.

The ~~invention~~disclosure is based, in part, on the unexpected finding that high-purity magnesium L-lactate crystals can be obtained from dispersions of decomposed organic waste such as lactic acid fermentation broths without the necessity of removing D-lactic acid during and/or after fermentation. The process involves the use of evaporative crystallization under specific conditions which yields high-purity magnesium L-lactate crystals already after a single pass despite the presence of significant amounts of impurities in the decomposed waste. Surprisingly, the process of the present ~~invention~~disclosure resulted in improved enantiomeric separation even when using decomposed organic

waste containing endogenous D-lactic acid of up to 10wt.%. The process of the present ~~invention~~disclosure is therefore simple and economic providing high purity magnesium L-lactate crystals even when a non-homogeneous feedstock comprising high concentrations of soluble and insoluble impurities from municipal, industrial, and commercial origins is used.

~~According to a first aspect, the~~The present ~~invention~~disclosure provides a process for the formation of high-purity magnesium L-lactate crystals from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar, including each value within the specified ranges.

In one aspect, the present disclosure provides a process for the formation of high-purity magnesium L-lactate crystals from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar.

According to one ~~embodiment~~example, the decomposed organic waste is obtained from a lactic acid fermentation process. According to another ~~embodiment~~example, the decomposed organic waste is obtained from a lactic acid-containing waste. According to yet another ~~embodiment~~example, the decomposed organic waste is obtained from hydrolysis of polylactic acid polymer.

~~According to a second aspect, the~~The present ~~invention~~disclosure provides a process for the formation of high-purity magnesium L-lactate crystals from a fermentation broth, the process comprising the steps of:

a. providing a clarified fermentation broth comprising a lactate salt in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified broth of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified fermentation broth of step (a) or the concentrated fermentation broth of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar, including each value within the specified ranges.

~~According to a third aspect, the~~The present ~~invention~~disclosure provides a process for the formation of high-purity magnesium L-lactate crystals from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at a temperature of about 100°C in the absence of a vacuum.

According to some ~~embodiments~~examples, the clarified dispersion or clarified broth comprises decomposed organic waste or fermentation broth from which impurities have been removed using at least one of filtration, centrifugation, flotation, sedimentation, coagulation, flocculation, and decantation. Each possibility represents a separate ~~embodiment~~example. According to additional ~~embodiments~~examples, the clarified dispersion or clarified

broth comprise decomposed organic waste or fermentation broth from which impurities have been removed using filtration and/or centrifugation.

According to other ~~embodiments~~examples, the organic waste comprises a carbohydrate source. According to further ~~embodiments~~examples, the organic waste is selected from food waste, municipal food waste, residential food waste, agricultural waste, industrial food waste from food processing facilities, commercial food waste (from hospitals, restaurants, shopping centers, airports etc.), and a mixture or combination thereof. Each possibility represents a separate ~~embodiment~~example.

According to particular ~~embodiments~~examples, the decomposed organic waste comprises endogenous D-lactic acid. According to specific ~~embodiments~~examples, the decomposed organic waste comprises up to 10wt.% endogenous D-lactic acid.

According to some ~~embodiments~~examples, step (b) is performed to a lactate salt concentration of about 100 to about 130 g/L, including each value within the specified range.

According to various ~~embodiments~~examples, the mixing in step (c) is performed at a speed of about 50 to about 300 rounds per minute (RPM), including each value within the specified range.

According to certain ~~embodiments~~examples, the mixing in step (c) is performed for at least 1 hour. According to other ~~embodiments~~examples, the mixing in step (c) is performed for about 1 to about 6 hours, including each value within the specified range.

According to further ~~embodiments~~examples, steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 80°C, including each value within the specified range. According to other ~~embodiments~~examples, steps (b) through (d) are performed with the application of a vacuum to a pressure of about 150 to about 250 mbar, including each value within the specified range. According to further ~~embodiments~~examples, steps (b) through (d) are performed with the application of a vacuum to a pressure of about 250 to about 350 mbar, including each value within the specified range.

According to particular ~~embodiments~~examples, removing from about 70% to about 90% of water from the suspension in step (d) is performed at an evaporation rate of about 2 to about 5 wt% per hour, including each value within the specified range.

According to various ~~embodiments~~examples, step (e) comprises filtration and/or centrifugation. According to specific ~~embodiments~~examples, step (e) is performed at room temperatures.

According to certain ~~embodiments~~examples, the process further comprises step (f) of washing the obtained magnesium L-lactate crystals. According to particular ~~embodiments~~examples, washing of the obtained magnesium L-lactate crystals is performed in a solvent selected from water, ethanol, propanol, isobutanol, cyclohexane, acetone, ethyl acetate, and a mixture or combination thereof. Each possibility represents a separate ~~embodiment~~example.

According to other ~~embodiments~~examples, the process further comprises step (g) of drying the magnesium L-lactate crystals to a Loss on Drying (LOD) % of about 10% to about 20%, including each value within the specified range. According to particular ~~embodiments~~examples, step (g) is performed at elevated temperatures of about 50°C to about 120°C, including each value within the specified range.

According to additional ~~embodiments~~examples, the obtained magnesium L-lactate crystals are solubilized and re-crystalized by reiterating steps (c) to (e). According to these ~~embodiments~~examples, steps (c) to (e) are performed in cycles, for example between two and six cycles, including each value within the specified range.

According to further ~~embodiments~~examples, the recovery of magnesium L-lactate crystals is at least 90%.

According to other ~~embodiments~~examples, the obtained magnesium L-lactate crystals are characterized by a median size which is smaller than 75 μm. According to certain ~~embodiments~~examples, the obtained magnesium L-lactate crystals are characterized by a size distribution comprising a median size in the range of about 20 to about 100 μm, including each value within the specified range. According to yet other ~~embodiments~~examples, the obtained magnesium L-lactate crystals are characterized by a median size which is larger than 75 μm. According to additional ~~embodiments~~examples, the obtained magnesium L-lactate crystals are characterized by a size distribution comprising a median size in the range of about 100 to about 300 μm, including each value within the specified range.

According to some ~~embodiments~~examples, the obtained magnesium L-lactate crystals comprise less than 3% magnesium D-lactate. According to certain ~~embodiments~~examples, the obtained magnesium L-lactate crystals comprise less than 2% magnesium D-lactate.

According to other ~~embodiments~~examples, the obtained magnesium L-lactate crystals comprise less than 1.5% magnesium D-lactate. According to yet other ~~embodiments~~examples, the obtained magnesium L-lactate crystals comprise less than 1% magnesium D-lactate.

~~According to additional embodiments, the~~The present ~~invention~~disclosure further provides high-purity magnesium L-lactate crystals obtainable by the process disclosed herein. In another aspect, the present disclosure provides a plurality of magnesium L-lactate crystals obtainable by the process disclosed herein.

~~According to further embodiments, the~~The present ~~invention~~disclosure provides a process for enriching L-lactate enantiomer from an enantiomeric mixture derived from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt comprising an enantiomeric mixture of D- and L-lactate in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals with enriched enantiomeric purity; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar, including each value within the specified ranges.

In another aspect, the present disclosure provides a process for enriching L-lactate enantiomer from an enantiomeric mixture derived from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt comprising an enantiomeric mixture of D- and L-lactate in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals with enriched enantiomeric purity; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar.

In one ~~embodiment~~example, the process provides enrichment of L-lactate enantiomer by 1% or more. In another ~~embodiment~~example, the process provides enrichment of L-lactate enantiomer by 5% or more. In yet another ~~embodiment~~example, the process provides enrichment of L-lactate enantiomer by 10% or more. In particular ~~embodiments~~examples, the process provides enrichment of L-lactate enantiomer of up to 15%. In other ~~embodiments~~examples, the process provides enrichment of L-lactate enantiomer of up to 20%. In yet other ~~embodiments~~examples, the process provides enrichment of L-lactate enantiomer of up to 25%.

It is to be understood that any combination of each of the aspects and the ~~embodiments~~examples disclosed herein is explicitly encompassed within the disclosure of the present ~~invention~~disclosure.

Further ~~embodiments~~examples and the full scope of applicability of the present ~~invention~~disclosure will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred ~~embodiments~~examples of the ~~invention~~disclosure, are given by way of illustration only, since various changes and modifications within the spirit and scope of the ~~invention~~disclosure will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows the size distribution of magnesium L-lactate crystals obtained according to some embodiments of the present invention.

Figures 2A-2F show light microscopy images of magnesium L-lactate crystals obtained according to some embodiments of the present invention that remained on top of sieves having cutoff sizes of 710 µm (2A), 500 µm (2B), 300 µm (2C), 100 µm (2D), and 75 µm (2E). Figure 2F shows a light microscopy image of magnesium L-lactate crystals that passed the 75 µm sieve.

Figure 3 shows the size distribution of magnesium L-lactate crystals obtained using cooling crystallization.

Figures 4A-4F show light microscopy images of magnesium L-lactate crystals obtained using cooling crystallization that remained on top of sieves having cutoff sizes of 710 µm (4A), 500 µm (4B), 300 µm (4C), 100 µm (4D), and 75 µm (4E). Figure 4F shows a light microscopy image of magnesium L-lactate crystals that passed the 75 µm sieve.

Figure 5 shows the size distribution of magnesium L-lactate crystals obtained according to some embodiments of the present invention following a recrystallization.

Figure 6 shows the size distribution of magnesium L-lactate crystals obtained using different evaporation rates.

Figure 7 shows the size distribution of magnesium L-lactate crystals obtained according to some embodiments of the present invention from a fed batch constant volume crystallization.

Figure 8 shows a light microscopy image of magnesium L-lactate crystals obtained according to some embodiments of the present invention from a fed batch constant volume crystallization.

CLAIMS

1. A process for the formation of high-purity magnesium L-lactate crystals from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar.

2. The process according to claim 1, wherein the clarified dispersion of decomposed organic waste comprises decomposed organic waste from which impurities have been removed using at least one of filtration, centrifugation, flotation, sedimentation, coagulation, flocculation, and decantation; or wherein the organic waste is selected from food waste, municipal food waste, residential food waste, agricultural waste, industrial food waste from food processing facilities, commercial food waste, and a mixture or combination thereof.

3. The process according to claim 1, wherein the decomposed organic waste comprises a fermentation broth~~wherein the clarified dispersion of decomposed organic waste comprises decomposed organic waste from which impurities have been removed using filtration and/or centrifugation~~.

4. The process according to ~~any one of~~ claim~~s 1 to~~ 3, wherein the fermentation broth is obtained from a fermentation process of a carbohydrate source or wherein the fermentation broth is obtained from a fermentation process of an organic waste

feedstock~~wherein the organic waste is selected from food waste, municipal food waste, residential food waste, agricultural waste, industrial food waste from food processing facilities, commercial food waste, and a mixture or combination thereof~~.

5. The process according to any one of claims 1 to 4, wherein step (b) is performed to a lactate salt concentration of about 100 to about 130 g/L.

6. The process according to any one of claims 1 to 5, wherein the mixing in step (c) is performed at a speed of about 50 to about 300 rounds per minute (RPM) or wherein the mixing in step (c) is performed for at least 1 hour.

~~7. The process according to any one of claims 1 to 6, wherein the mixing in step (c) is performed for at least 1 hour.~~

~~8~~7. The process according to any one of claims 1 to ~~7~~6, wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 80°C; or wherein steps (b) through (d) are performed with the application of a vacuum to a pressure of about 150 to about 250 mbar.

~~9. The process according to any one of claims 1 to 8, wherein steps (b) through (d) are performed with the application of a vacuum to a pressure of about 150 to about 250 mbar.~~

~~10~~8. The process according to any one of claims 1 to ~~9~~7, wherein step (d) is performed at an evaporation rate of about 2 to about 5 wt% per hour.

~~11~~9. The process according to any one of claims 1 to ~~10~~8, wherein step (e) comprises filtration and/or centrifugation; or wherein step (e) is performed at room temperatures.

~~12. The process according to any one of claims 1 to 11, wherein step (e) is performed at room temperatures.~~

~~13~~10. The process according to any one of claims 1 to ~~12~~9, further comprising step (f) of washing the obtained magnesium L-lactate crystals.

~~14~~11. The process according to claim ~~13~~10, wherein washing of the obtained magnesium L-lactate crystals is performed in a solvent selected from water, ethanol, propanol, isobutanol, cyclohexane, acetone, ethyl acetate, and a mixture or combination thereof.

~~15~~12. The process according to any one of claims 1 to ~~14~~11, further comprising step (g) of drying the magnesium L-lactate crystals to a Loss on Drying (LOD) % of about 10% to about 20%, wherein drying is performed at elevated temperatures of about 50°C to about 120°C.

~~16. The process according to claim 15, wherein drying is performed at elevated temperatures of about 50°C to about 120°C.~~

~~17~~13. The process according to any one of claims 1 to ~~16~~12, wherein the obtained magnesium L-lactate crystals are solubilized and re-crystalized by reiterating steps (c) to (e).

~~18~~14. The process according to any one of claims 1 to ~~17~~13, wherein the recovery of magnesium L-lactate crystals is at least 90%.

~~19~~15. The process according to any one of claims 1 to ~~18~~14, wherein the obtained magnesium L-lactate crystals are characterized by a median size smaller than 75 µm.

~~20~~16. The process according to any one of claims 1 to ~~18~~14, wherein the obtained magnesium L-lactate crystals are characterized by a median size larger than 75 µm; or wherein the obtained magnesium L-lactate crystals are characterized by a size distribution comprising a median size in the range of about 100 to about 300 µm.

~~21. The process according to claim 20, wherein the obtained magnesium L-lactate crystals are characterized by a size distribution comprising a median size in the range of about 100 to about 300 µm.~~

~~22~~17. The process according to any one of claims 1 to ~~21~~16, wherein the obtained magnesium L-lactate crystals comprise less than 3% magnesium D-lactate~~, preferably less than 2% magnesium D-lactate, more preferably less than 1.5% magnesium D-lactate, and most preferably less than 1% magnesium D-lactate~~.

~~23~~18. A plurality of magnesium L-lactate crystals obtainable by the process of any one of claims 1 to ~~22~~17.

~~24. A process for the formation of high-purity magnesium L-lactate crystals from a fermentation broth, the process comprising the steps of:~~

~~a. providing a clarified fermentation broth comprising a lactate salt in a concentration of about 50 to about 110 g/L;~~

~~b. optionally concentrating the clarified fermentation broth of step (a) to a lactate salt concentration of about 100 to about 150 g/L;~~

~~c. mixing the clarified fermentation broth of step (a) or the concentrated fermentation broth of step (b) to obtain a suspension comprising seed magnesium L-lactate crystals;~~

~~d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals; and~~

~~e. collecting the magnesium L-lactate crystals obtained in step (d),~~

~~wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar.~~

~~25. The process according to claim 24, wherein the clarified fermentation broth comprises a fermentation broth from which impurities have been removed using at least one of filtration, centrifugation, flotation, sedimentation, coagulation, flocculation, and decantation.~~

~~26. The process according to claim 24, wherein the clarified fermentation broth comprises a fermentation broth from which impurities have been removed using filtration and/or centrifugation.~~

~~27. The process according to any one of claims 24 to 26, wherein the clarified fermentation broth is obtained from a fermentation process of a carbohydrate source.~~

~~28. The process according to any one of claims 24 to 26, wherein the clarified fermentation broth is obtained from a fermentation process of an organic waste feedstock.~~

~~29. The process according to claim 28, wherein the organic waste is selected from food waste, municipal food waste, residential food waste, agricultural waste, industrial food waste from food processing facilities, commercial food waste, and a mixture or combination thereof.~~

~~30. The process according to any one of claims 24 to 29, wherein step (b) is performed to a lactate salt concentration of about 100 to about 130 g/L.~~

~~31. The process according to any one of claims 24 to 30, wherein the mixing in step (c) is performed at a speed of about 50 to about 300 rounds per minute (RPM).~~

~~32. The process according to any one of claims 24 to 31, wherein the mixing in step (c) is performed for at least 1 hour.~~

~~33. The process according to any one of claims 24 to 32, wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 80°C.~~

~~34. The process according to any one of claims 24 to 33, wherein steps (b) through (d) are performed with the application of a vacuum to a pressure of about 150 to about 250 mbar.~~

~~35. The process according to any one of claims 24 to 34, wherein step (d) is performed at an evaporation rate of about 2 to about 5 wt% per hour.~~

~~36. The process according to any one of claims 24 to 35, wherein step (e) comprises filtration and/or centrifugation.~~

~~37. The process according to any one of claims 24 to 36, wherein step (e) is performed at room temperatures.~~

~~38. The process according to any one of claims 24 to 37, further comprising step (f) of washing the obtained magnesium L-lactate crystals.~~

~~39. The process according to claim 38, wherein washing of the obtained magnesium L-lactate crystals is performed in a solvent selected from water, ethanol, propanol, isobutanol, cyclohexane, acetone, ethyl acetate, and a mixture or combination thereof.~~

~~40. The process according to any one of claims 24 to 39, further comprising step (g) of drying the magnesium L-lactate crystals to a Loss on Drying (LOD) % of about 10% to about 20%.~~

~~41. The process according to claim 40, wherein drying is performed at elevated temperatures of about 50°C to about 120°C.~~

~~42. The process according to any one of claims 24 to 41, wherein the obtained magnesium L-lactate crystals are solubilized and re-crystalized by reiterating steps (c) to (e).~~

~~43. The process according to any one of claims 24 to 42, wherein the recovery of magnesium L-lactate crystals is at least 90%.~~

~~44. The process according to any one of claims 24 to 43, wherein the obtained magnesium L-lactate crystals are characterized by a median size smaller than 75 µm.~~

~~45. The process according to any one of claims 24 to 43, wherein the obtained magnesium L-lactate crystals are characterized by a median size larger than 75 µm.~~

~~46. The process according to claim 45, wherein the obtained magnesium L-lactate crystals are characterized by a size distribution comprising a median size in the range of about 100 to about 300 µm.~~

~~47. The process according to any one of claims 24 to 46, wherein the obtained magnesium L-lactate crystals comprise less than 3% magnesium D-lactate, preferably less than 2% magnesium D-lactate, more preferably less than 1.5% magnesium D-lactate, and most preferably less than 1% magnesium D-lactate.~~

~~48. A plurality of magnesium L-lactate crystals obtainable by the process of any one of claims 24 to 47.~~

~~49~~19. A process for enriching L-lactate enantiomer from an enantiomeric mixture derived from decomposed organic waste, the process comprising the steps of:

a. providing a clarified dispersion of decomposed organic waste comprising a lactate salt comprising an enantiomeric mixture of D- and L-lactate in a concentration of about 50 to about 110 g/L;

b. optionally concentrating the clarified dispersion of step (a) to a lactate salt concentration of about 100 to about 150 g/L;

c. mixing the clarified dispersion of step (a) or the concentrated clarified dispersion of step (b) to obtain a suspension comprising seed magnesium lactate crystals;

d. removing from about 70% to about 90% of water from the suspension of step (c) to obtain magnesium L-lactate crystals with enriched enantiomeric purity; and

e. collecting the magnesium L-lactate crystals obtained in step (d),

wherein steps (b) through (d) are performed at elevated temperature in the range of about 50°C to about 90°C and the application of a vacuum to a pressure of about 80 to about 300 mbar.

~~50~~20. The process according to claim ~~49~~19, wherein the obtained magnesium L-lactate crystals comprise less than 1% magnesium D-lactate.