We claim:

1. A process for recovering permanganate reducing compounds (PRCs) from a crude acetic acid composition, the process comprising the steps of:

separating the crude acetic acid composition in a light ends column into an overhead stream comprising methyl iodide, water, methyl acetate, and at least one PRC, and an acetic acid product stream;

separating a portion of the overhead stream using a first distillation column to obtain a stream enriched in the at least one PRC, wherein the enriched stream further comprises at least some of the methyl iodide from the overhead stream; and

separating a portion of the enriched stream in a second distillation column to obtain a distillate comprising methyl iodide and a residue comprising the at least one PRC and optionally less than 1 wt.% methyl iodide, wherein the ratio of methyl iodide to PRCs in the residue is less than the ratio of methyl iodide to PRCs in the enriched stream, and wherein an extractive agent, optionally selected from the group consisting of water, glycols, glycerol, high boiling alcohols, and mixtures thereof, is optionally used in the second distillation column to extract at least one PRC into the residue.

2. The process of claim 1, wherein a mass flow ratio of the portion of the enriched stream and the extractive agent is at least 0.01:1.

3. The process of claim 1, further comprising recovering the extractive agent from the residue to yield a PRCs product that is reduced in water content and/or returning at least a portion of the distillate to a carbonylation zone for producing the crude acetic acid composition.

4. The process of claim 1, wherein the distillate comprises less of the at least one PRC than the enriched stream, based on relative mass flow.

5. The process of claim 1, wherein the overhead stream further comprises at least one alkyl iodide selected from the group consisting of ethyl iodide, propyl iodide, butyl iodide, pentyl iodide, hexyl iodide, and isomers and mixtures thereof.

6. The process of claim 1, wherein at least 80% of the methyl iodide in the portion of the enriched stream is separated into the distillate and/or at least 80% of the at least one PRC in the portion of the enriched stream is separated into the residue.

7. The process of claim 1, wherein the at least one PRC is selected from the group consisting of acetaldehyde, acetone, methyl ethyl ketone, butyraldehyde, crotonaldehyde, 2-ethyl crotonaldehyde, 2-ethyl butyraldehyde, aldol condensation products thereof, and mixtures thereof.

8. The process of claim 1, wherein the separation of the portion of the enriched stream comprises extracting the enriched stream in a liquid-liquid extractor with an extractive solvent, preferably comprising water, to obtain a PRCs stream and a raffinate comprising methyl iodide, wherein the PRCs stream comprises the at least one PRC and from 0.01 to 5 wt.% methyl iodide.

9. The process of claim 1, further comprising condensing and biphasically separating the overhead stream into a heavy phase and a light phase.

10. The process of claim 9, further comprising separating the light phase in the one or more distillation columns to obtain the enriched stream.

11. The process of claim 9, further comprising separating the heavy phase in the one or more distillation columns to obtain the enriched stream.

12. A process for recovering permanganate reducing compounds (PRCs) from a crude acetic acid composition, the process comprising the steps of:

separating the crude acetic acid composition in a light ends column into an overhead stream comprising methyl iodide, water, methyl acetate, and at least one PRC, and an acetic acid product stream;

separating a portion of the overhead stream using one or more distillation columns to obtain a stream enriched in the at least one PRC, wherein the enriched stream further comprises at least some of the methyl iodide from the overhead stream;

extracting the enriched stream in a liquid-liquid extractor with an extractive solvent to obtain a PRCs stream and a raffinate comprising methyl iodide, wherein the PRCs stream comprises the at least one PRC and from 0.01 to 5 wt.% methyl iodide; and

separating a portion of the PRCs stream in an extractive distillation column using an extractive agent to obtain a distillate comprising methyl iodide and a residue comprising the at least one PRC and extractive agent, wherein the ratio of methyl iodide to PRCs in the residue is less than the ratio of methyl iodide to PRCs in the PRCs stream.

13. The process of claim 12, further comprising condensing and biphasically separating the overhead stream into a heavy phase and a light phase.

14. The process of claim 13, further comprising separating the light phase in the one or more distillation columns to obtain the enriched stream.

15. The process of claim 13, further comprising separating the heavy phase in the one or more distillation columns to obtain the enriched stream.

We claim:

1. A process for recovering permanganate reducing compounds (PRC's) from a crude acetic acid composition, the process comprising the steps of:

separating the crude acetic acid composition in a light ends column into an overhead stream comprising methyl iodide, water, methyl acetate, and at least one PRC, and an acetic acid product stream;

separating a portion of the overhead stream using a first distillation column to obtain a stream enriched in the at least one PRC, wherein the enriched stream further comprises at least some of the methyl iodide from the overhead stream; and

separating a portion of the enriched stream in a second distillation column to obtain a distillate comprising methyl iodide and a residue comprising the at least one PRC, wherein the ratio of methyl iodide to PRC's in the residue is less than the ratio of methyl iodide to PRC's in the enriched stream.

2. The process of claim 1, further comprising the step of using an extractive agent in the second distillation column to extract at least one PRC into the residue.

3. The process of claim 2, wherein a mass flow ratio of the portion of the enriched stream and the extractive agent is at least 0.01:1.

4. The process of claim 2, further comprising recovering the extractive agent from the residue to yield a PRC's product that is reduced in water content.

5. The process of claim 2, wherein the extractive agent is selected from the group consisting of water, glycols, glycerol, high boiling alcohols, and mixtures thereof.

6. The process of claim 1, wherein the residue comprises less than 1 wt. % methyl iodide.

7. The process of claim 1, further comprising returning at least a portion of the distillate to a carbonylation process for producing the crude acetic acid composition.

8. The process of claim 1, wherein the distillate comprises less of the at least one PRC than the enriched stream, based on relative mass flow.

9. The process of claim 1, wherein the overhead stream further comprises at least one alkyl iodide selected from the group consisting of ethyl iodide, propyl iodide, butyl iodide, pentyl iodide, hexyl iodide, and isomers and mixtures thereof.

10. The process of claim 1, wherein at least 80% of the methyl iodide in the portion of the enriched stream is separated into the distillate.

11. The process of claim 1, wherein at least 80% of the at least one PRC in the portion of the enriched stream is separated into the residue.

12. The process of claim 1, wherein the at least one PRC is selected from the group consisting of acetaldehyde, acetone, methyl ethyl ketone, butyraldehyde, crotonaldehyde, 2-ethyl crotonaldehyde, 2-ethyl butyraldehyde, aldol condensation products thereof, and mixtures thereof.

13. The process of claim 1, further comprising the step of extracting the enriched stream in a liquid-liquid extractor with an extractive solvent to obtain a PRC's stream and a raffinate comprising methyl iodide, wherein the PRC's stream comprises the at least one PRC and from 0.01 to 5 wt. % methyl iodide, and wherein the portion of the enriched stream comprises the PRC's stream.

14. The process of claim 13, wherein the liquid-liquid extractive solvent comprises water.

15. The process of claim 1, further comprising condensing and biphasically separating the overhead stream into a heavy phase and a light phase.

16. The process of claim 15, further comprising separating the light phase in the one or more distillation columns to obtain the enriched stream.

17. The process of claim 15, further comprising separating the heavy phase in the one or more distillation columns to obtain the enriched stream.

18. A process for recovering permanganate reducing compounds (PRC's) from a crude acetic acid composition, the process comprising the steps of:

separating the crude acetic acid composition in a light ends column into an overhead stream comprising methyl iodide, water, methyl acetate, and at least one PRC, and an acetic acid product stream;

separating a portion of the overhead stream using one or more distillation columns to obtain a stream enriched in the at least one PRC, wherein the enriched stream further comprises at least some of the methyl iodide from the overhead stream;

extracting the enriched stream in a liquid-liquid extractor with an extractive solvent to obtain a PRC's stream and a raffinate comprising methyl iodide, wherein the PRC's stream comprises the at least one PRC and from 0.01 to 5 wt. % methyl iodide; and

separating a portion of the PRC's stream in an extractive distillation column using an extractive agent to obtain a distillate comprising methyl iodide and a residue comprising the at least one PRC and extractive agent, wherein the ratio of methyl iodide to PRC's in the residue is less than the ratio of methyl iodide to PRC's in the PRC's stream.

19. The process of claim 18, further comprising condensing and biphasically separating the overhead stream into a heavy phase and a light phase.

20. The process of claim 19, further comprising separating the light phase in the one or more distillation columns to obtain the enriched stream.

21. The process of claim 19, further comprising separating the heavy phase in the one or more distillation columns to obtain the enriched stream.