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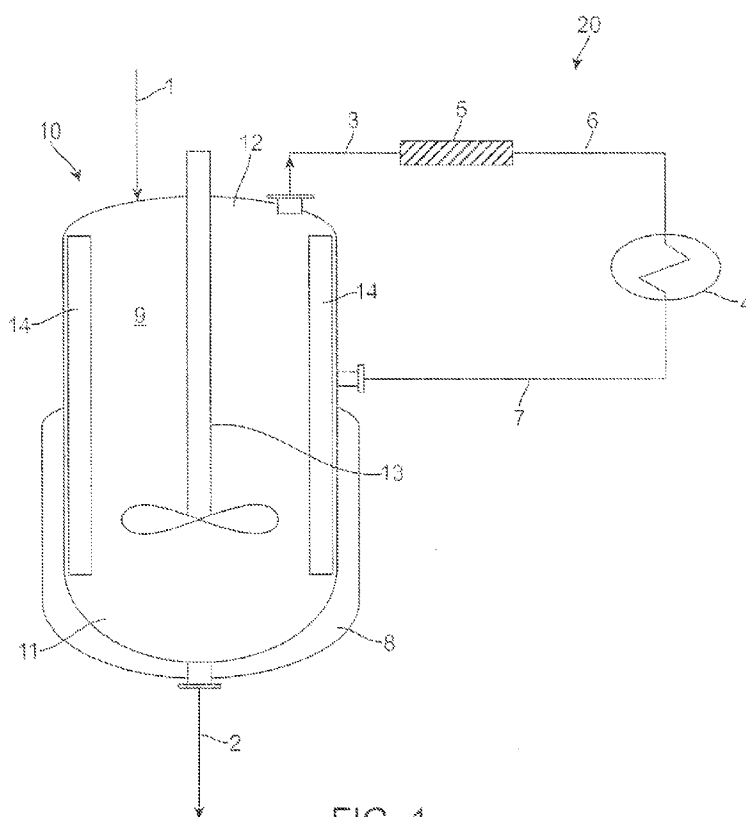
(54) Title: A PROCESS TO REMOVE DISSOLVED $AlCl_3$ FROM IONIC LIQUID

FIG. 1

(57) Abstract: Disclosed herein are processes in which precipitation permits removal of metal halides (e.g. $AlCl_3$) from ionic liquids. After precipitation, the precipitated metal halides can be physically separated from the bulk ionic liquid. More effective precipitation can be achieved through cooling or the combination of cooling and the provision of metal halide seed crystals. The ionic liquids can be regenerated ionic liquid catalysts, which contain excess metal halides after regeneration. Upon removal of the excess metal halides, they can be reused in processes using ionic liquid catalysts, such as alkylation processes.



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AMENDED CLAIMS
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WHAT IS CLAIMED IS:

1. A process for removing metal halides from an ionic liquid, comprising causing metal halides that are dissolved in the ionic liquid to precipitate out of the ionic liquid.
2. The process according to claim 1, further comprising cooling a mixture comprising the metal halides that are dissolved in the ionic liquid and the ionic liquid to precipitate the metal halides out of the ionic liquid.
3. The process according to claim 1, further comprising cooling a mixture comprising the metal halides that are dissolved in the ionic liquid and the ionic liquid; wherein the ionic liquid additionally contains metal halide seed crystals and the cooling grows the metal halide seed crystals and provides precipitated metal halides.
4. The process according to claim 3, further comprising separating the precipitated metal halides from the mixture by decantation or filtration.
5. The process according to claim 3, further comprising separating the precipitated metal halides from the mixture by filtration.
6. The process according to claim 2, wherein the mixture is cooled to a temperature less than about 50°C.
7. The process according to claim 2, wherein the mixture is cooled to about room temperature or to less than about room temperature.
8. The process according to claim 1, wherein the ionic liquid is a regenerated ionic liquid catalyst.

9. The process according to claim 1, wherein the metal halide is AlCl_3 .
10. The process according to claim 1, wherein the metal is a Group III-A, II-B, or I-B metal.
11. A process for removing dissolved metal halides from an ionic liquid, comprising:
 - a) feeding the ionic liquid comprising dissolved metal halides to a vessel and providing metal halide seed crystals to provide a mixture comprising ionic liquid, dissolved metal halides, and metal halide seed crystals;
 - b) cooling the mixture in the vessel to provide precipitated metal halides; and
 - c) removing the precipitated metal halides from the vessel.
12. The process according to claim 11, further comprising removing from an upper portion of the vessel at least a portion of the mixture, cooling the portion in a heat exchanger, and reintroducing the portion to the vessel.
13. The process according to claim 12, further comprising filtering the removed portion prior to cooling the removed portion.
14. The process according to claim 13, wherein the removed portion is reintroduced into the vessel at a rate between about 5 and about 50 times an ionic liquid feed rate.
15. A process for regenerating an ionic liquid catalyst, comprising:
 - a) reacting an ionic liquid catalyst with aluminum to provide a regenerated ionic liquid catalyst containing excess dissolved AlCl_3 ;

b) precipitating the excess dissolved AlCl_3 from the regenerated ionic liquid catalyst to provide a precipitated excess AlCl_3 ; and

c) removing the precipitated excess AlCl_3 from the regenerated ionic liquid catalyst.

16. The process according to claim 15, further comprising cooling the regenerated ionic liquid catalyst to precipitate excess dissolved AlCl_3 from the regenerated ionic liquid catalyst.

17. The process according to claim 16, wherein the cooling step provides AlCl_3 seed crystals.

18. The process according to claim 15, further comprising separating the precipitated excess AlCl_3 by filtration.

19. The process according to claim 15, wherein the mixture is cooled to a temperature less than about 50°C .

20. The process according to claim 15, wherein the mixture is cooled to about room temperature or to less than about room temperature.

21. An alkylation process, comprising:

a) conducting an alkylation reaction with an ionic liquid catalyst to provide a product and a spent ionic liquid catalyst;

b) reacting the spent ionic liquid catalyst with aluminum to provide a regenerated ionic liquid catalyst and excess dissolved AlCl_3 ;

c) precipitating the excess dissolved AlCl_3 from the regenerated ionic liquid catalyst to provide precipitated excess AlCl_3 ;

d) removing the precipitated excess AlCl_3 from the regenerated ionic liquid catalyst; and

e) recycling the regenerated ionic liquid catalyst to reaction step a).