(Journal of Molecular Catalysis, 92 (1994), 155-165; "Ionic Liquids in Synthesis", P. Wasserscheid and T. Welton (eds.), Wiley-VCH Verlag, 2003, pp 275).

In general, conversion of light paraffins and light olefins to more valuable cuts is very lucrative to the refining industries. This has been accomplished by alkylation of paraffins with olefins, and by polymerization of olefins. One of the most widely used processes in this field is the alkylation of isobutane with C_3 to C_5 olefins to make gasoline cuts with high octane number using sulfuric and hydrofluoric acids. This process has been used by refining industries since the 1940's. The process was driven by the increasing demand for high quality and clean burning high-octane gasoline.

Alkylate gasoline is a high quality and efficient burning gasoline that constitutes about 14% of the gasoline pool. Alkylate gasoline is typically produced by alkylating refineries isobutane with low-end olefins (mainly butenes). Currently, alkylates are produced by using HF and H_2SO_4 as catalysts. Although these catalysts have been successfully used to economically produce the best quality alkylates, the need for safer and more environmentally friendly catalysts systems has become an issue to the industries involved.

SUMMARY OF THE DISCLOSURE~~INVENTION~~

The present disclosure~~invention~~ relates to methods for reducing halide concentration in a hydrocarbon products made by a hydrocarbon conversion processes using ionic liquid catalyst comprising a halogen-containing an acidic ionic liquid comprising: (i)

separating at least a portion of the hydrocarbon product from the ionic liquid catalyst used in the hydrocarbon conversion process from the hydrocarbon product; (ii) contacting at least a portion of the separated hydrocarbon product with an ionic liquid catalyst having the same formula as the ionic liquid catalyst used in the hydrocarbon conversion process; (iii) separating at least a portion of the hydrocarbon product from the ionic liquid catalyst of step (ii); and (iv) recovering at least a portion of the separated hydrocarbon product of step (iii) having a halide concentration less than the halide concentration of the hydrocarbon product of step (i).

In a first aspect, there is provided a method for reducing halide concentration in a hydrocarbon product made by a hydrocarbon conversion process that is an isoparaffin alkylation using an ionic liquid catalyst comprising a halogen-containing acidic ionic liquid comprising: (i) separating at least a portion of the hydrocarbon product form the ionic liquid catalyst used in the hydrocarbon conversion process from the hydrocarbon product; (ii) contacting the at least a portion of the separated hydrocarbon product of step (i) with an ionic liquid catalyst having the same formula as the ionic liquid catalyst used in the hydrocarbon conversion process; (iii) separating at least a portion of the hydrocarbon product from the ionic liquid catalyst of step (ii); and (iv) recovering at least a portion of the separated hydrocarbon product of step (iii) having a halide concentration less than the halide concentration of the at least a portion of the separated hydrocarbon product of step (i); wherein the halide concentration in the recovered hydrocarbon in step (iv) is at least 30% less than the halide concentration of the hydrocarbon product of step (i).

In a second aspect, there is provided an alkylation process comprising: (i) contacting a first hydrocarbon feed comprising at least one olefin having from 2 to 6 carbon atoms and a second hydrocarbon feed comprising at least one isoparaffin having from 3 to 6 carbon atoms with a halogen-containing acidic ionic liquid comprising Al_2Cl_7 catalyst under alkylation conditions to produce an alkylate having an organic halide content from 50 to 4000 ppm; (ii) separating at least a first portion of the alkylate form the ionic liquid catalyst; (iii) contacting the at least a first portion of the separated alkylate with an ionic liquid catalyst having the same formula as the ionic liquid catalyst used for production of the alkylate in step (i); (iv) separating at least a second portion of the alkylate from the ionic liquid catalyst after step (ii); and (v) recovering at least a portion of the separated alkylate of step (iv) having a halide concentration less than the halide concentration of the at least a first portion of the alkylate of step (ii); wherein the halide concentration in the recovered hydrocarbon in step (v) is at least 30% less than the halide content of the alkylate of step (i).

In a third aspect, there is provided a method for reducing halide concentration in a hydrocarbon product made by a hydroconversion process, comprising: (i) separating at least a portion of a halide containing hydrocarbon product from an ionic liquid catalyst used in the hydroconversion process from the hydrocarbon product, wherein the ionic liquid catalyst comprises Al_2Cl_7; (ii) contacting the at least a portion of the separated halide containing hydrocarbon product of step (i) with an ionic liquid catalyst having the same formula as the ionic liquid catalyst used in the hydroconversion process in the presence of isobutane (iii) separating at least a portion of the halide containing hydrocarbon product from the ionic

liquid catalyst of step (ii); and (iv) recovering at least a portion of the separated halide containing hydrocarbon product of step (iii) having a halide concentration less than the halide concentration of the at least a portion of the separated halide containing hydrocarbon product of step (i); wherein the halide level in the recovered halide containing hydrocarbon product in step (iv) is reduced by 70 wt% or greater and the hydrocarbon product is not degraded.

Other aspects, features and advantages will be apparent from the description of the embodiments thereof and from the claims.

DETAILED DESCRIPTION

Hydrocarbon conversion processes using a halogen-containing acidic ionic liquid catalyst will generally produce a hydrocarbon product having an organic halide impurity content from 50 to 4000 ppm. Examples of such processes include alkylation, polymerization, dimerization, oligomerization, acetylation, metatheses, copolymerization, isomerization, olefin hydrogenation, hydroformylation and other known processes. The presence of organic halides in such products may be undesirable. The present process can be used to reduce the organic halide concentration is such hydrocarbon products.