continuous process, such gases, particularly nitrogen, would rapidly accumulate if not separated A clear need exists for an efficient, cost-effective process of separating inert gases and other compounds from halogens.

SUMMARY ~~OF THE INVENTION~~

[0005] According to the present disclosure~~invention~~, a process is provided for separating one or more light gases from bromine or chlorine using one or more physical separations and contact with a chemical scrubber to recover additional halogen. According to one embodiment~~aspect~~ of the present disclosure~~invention~~, the process comprises (a) providing a feed of halogen containing one or more light gases to a distillation column or flash vaporizer; (b) operating the distillation column or flash vaporizer to separate the feed into (i) a first liquid containing a major amount of halogen and no more than a minor amount of light gas(es), and (ii) a first vapor containing a major amount of light gas(es) and no more than a minor amount of halogen; and (c) providing the vapor to a chemical scrubber to recover halogen from the vapor. According to an aspect, there is provided a process for separating light gas(es) comprising nitrogen from bromine, comprising: (a) providing a feed of bromine and one or more light gas(es) comprising nitrogen to a distillation column or flash vaporizer; (b) operating the distillation column or flash vaporizer to separate the feed into (i) a first liquid containing more bromine than light gas(es), and (ii) a first vapor containing more light gas(es) than bromine; and (c) providing the first vapor to a chemical scrubber comprising a solid bromine scavenger to recover the bromine from the first vapor, wherein the solid bromine scavenger sorbs the bromine through a chemical reaction with the bromine.

[0006] In a second embodiment~~aspect~~ of the present disclosure~~invention~~, two or more physical separations are used, with each separation leading to successively greater enrichment of, respectively, the halogen in the liquid phase and the light gas(es) in the vapor phase. For example, the vapor from a distillation column (enriched in light gas(es)) can be fed to a second distillation column, which further separates the material into a new vapor and a new liquid, the new vapor being more enriched in light gas(es), and the new liquid being more enriched in halogen.

[0007] The chemical scrubber utilized in the present disclosure~~invention~~ contains one or more halogen scavengers, materials which are capable of chemically sorbing halogen, in some embodiments through a redox reaction with the halogen. A preferred material is copper (I) bromide (CuBr, "cuprous bromide"), which can adsorb bromine by conversion into copper (II) bromide (CuBr2, "cupric bromide").

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The features and advantages of the invention will become better understood when considered in light of the following detailed description, and by making reference to the following drawings, wherein:

[0009] Figure 1 is a schematic diagram of a process for separating light gases from bromine according to one aspect of the invention;

[0010] Figure 2 is a schematic diagram of the process shown in Figure 1, with the additional elements of bromine formation ("bromine regeneration") and water adsorption;

[0011] Figure 3 is a schematic diagram of a process for separating light gas(es) from bromine, utilizing three flash vaporizers run in series, according to another aspect of the invention;