CLAIMS

1. A process for separating light gas(es) comprising nitrogen from bromine ~~or chlorine~~, comprising:

(a) providing a feed of ~~a halogen~~ 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 ~~halogen~~ bromine than light gas(es), and (ii) a first vapor containing more light gas(es) than ~~halogen~~ bromine; and

(c) providing the first vapor to a chemical scrubber comprising a solid bromine scavenger to recover the ~~halogen~~ bromine from the first vapor, wherein the solid bromine scavenger sorbs the bromine through a chemical reaction with the bromine.

2. A process as recited in claim 1, further comprising providing the first liquid to a distillation column or flash vaporizer to separate the first liquid into (i) a second liquid containing more ~~halogen~~ bromine than light gas(es), and (ii) a second vapor containing more light gas(es) than ~~halogen~~ bromine; and

(c) providing the second vapor to a chemical scrubber comprising a solid bromine scavenger to recover the ~~halogen~~ bromine from the second vapor, wherein the solid bromine scavenger sorbs the bromine through a chemical reaction with the bromine.

~~3. A process as recited in claim 1, wherein the halogen is bromine.~~

~~4. A process as recited in claim 1, wherein the halogen is chlorine.~~

~~5. A process as recited in claim 1, wherein the light gas(es) comprise nitrogen.~~

~~6.~~3. A process as recited in claim 1, wherein the light gas(es) further comprise(s) ~~nitrogen and~~ one or more of additional gases selected from the group consisting of carbon dioxide and a C_1 - C_4 hydrocarbon.

~~7.~~4. A process as recited in claim 1, wherein the chemical scrubber comprises a bed of a supported or an unsupported ~~halogen~~solid bromine scavenger.

~~8.~~5. A process as recited in claim ~~7~~4, wherein the ~~halogen~~solid bromine scavenger comprises a material selected from the group consisting of CuBr, CuCl, $FeBr_2$, $FeCl_2$, AuCl, AuBr, InBr, InCl, FeO, Cu_2O, Hg_2Br_2, Cu, Ag, Au, Hg, Pt, Pd, Ru, Rh, Fe, Os, Ir and mixtures thereof.

~~9.~~6. A process as recited in claim ~~7~~4, wherein the ~~halogen~~ solid bromine scavenger comprises CuBr.

~~10.~~7. A process as recited in claim ~~7~~4, wherein the ~~halogen~~ solid bromine scavenger is supported on a material selected from the group consisting of metal oxides, metal carbides, metal nitrides, carbon, clay, and mixtures thereof.

~~11.~~8 A process as recited in claim ~~7~~4, wherein the ~~halogen~~ solid bromine scavenger is supported on a material selected from the group consisting of Al_2O_3, SiO_2, ZrO_2, TiO_2, WO_3, CaO, MgO, Cr_2O, SiC, Mo_4C, TiN, W_2N, carbon, zeolite, vermiculite, and mixtures thereof.

~~12.~~9. A process as recited in claim 1, further comprising heating the chemical ~~scrubber to~~ scrubber to release ~~halogen~~bromine therefrom.

~~13. A process as recited in claim 1, wherein the chemical scrubber is a solid and sorbs the halogen through a chemical reaction with the halogen.~~