a catalytically effective amount of silver supported on a high purity carrier, a promoting amount of at least one Group IA metal, and a promoting amount of rhenium;

b) yielding from the reactor a reactor outlet gas mixture comprising ethylene oxide, ethylene, oxygen, water and carbon dioxide;

c) providing at least a portion of the reactor outlet gas mixture to an ethylene oxide absorber to produce an ethylene oxide stream and a treated gas stream comprising water and carbon dioxide;

d) providing at least a portion of the treated gas stream to a carbon dioxide absorber unit;

e) operating the carbon dioxide absorber unit to produce a recycle gas stream comprising carbon dioxide and water; and

f) combining at least a portion of the recycle gas stream from the carbon dioxide absorber unit with fresh feeds comprising oxygen and ethylene and at least a portion of a remaining portion, if any, of the treated gas stream, to form the reactor inlet gas mixture, wherein:

(i) a partial pressure of water vapor at the reactor inlet is at least 8 kPa; and

(ii) the partial pressure of water vapor at the reactor inlet is continuously maintained at at least 8 kPa over a period corresponding to the production of at least 250 kmole of ethylene oxide per cubic meter of catalyst.

In another aspect, there is provided a method of producing ethylene oxide comprising:

a) providing to a reactor a reactor inlet gas mixture comprising ethylene, an oxygen-containing gas, one or more gas phase promoters, water and carbon dioxide, wherein the one or more gas phase promoters are organic chlorides, the components of the gas mixture subsequently being contacted within the reactor under epoxidation reaction conditions with a catalyst comprising a catalytically effective amount of silver supported on a high purity carrier, a promoting amount of at least one Group IA metal, and a promoting amount of rhenium;

b) yielding from the reactor a reactor outlet gas mixture comprising ethylene oxide, ethylene, oxygen, water and carbon dioxide;

c) providing at least a portion of the reactor outlet gas mixture to an ethylene oxide absorber to produce an ethylene oxide stream and a treated gas stream comprising water and carbon dioxide;

d) combining at least a portion of the treated gas stream with fresh feeds comprising ethylene and providing at least a portion of the combined stream to a carbon dioxide absorber unit;

e) operating the carbon dioxide absorber unit to produce a recycle gas stream comprising carbon dioxide and water; and

f) combining at least a portion of the recycle gas stream from the carbon dioxide absorber unit with fresh feeds comprising oxygen and at least a portion of a remaining portion, if any, of the treated gas stream, to form the reactor inlet gas mixture,

wherein:

(i) a partial pressure of water vapor at the reactor inlet is at least 8 kPa; and

(ii) the partial pressure of water vapor at the reactor inlet is continuously maintained at at least 8 kPa over a period corresponding to the production of at least 250 kmole of ethylene oxide per cubic meter of catalyst.

In another aspect, there is provided a method for making an ethylene glycol, an ethylene glycol ether, an ethylene carbonate or an ethanolamine comprising:

obtaining an ethylene oxide by a method for the production of ethylene oxide as disclosed above; and

converting the ethylene oxide into an ethylene glycol, an ethylene glycol ether or an ethanolamine.

We have found a method for the production of ethylene oxide wherein the partial pressure of water vapor at the inlet of the reactor is at least 8 kPa. The method comprises providing to a reactor a reactor inlet gas mixture comprising ethylene, oxygen,

WHAT IS CLAIMED IS:

1. A method of producing ethylene oxide comprising:

a) providing to a reactor a reactor inlet gas mixture comprising ethylene, oxygen, one or more gas phase promoters, water and carbon dioxide, wherein the one or more gas phase promoters are organic chlorides, the components of the gas mixture subsequently being contacted within the reactor under epoxidation reaction conditions with a catalyst comprising a catalytically effective amount of silver supported on a high purity carrier, a promoting amount of at least one Group IA metal, and a promoting amount of rhenium;

b) yielding from the reactor a reactor outlet gas mixture comprising ethylene oxide, ethylene, oxygen, water and carbon dioxide;

c) providing at least a portion of the reactor outlet gas mixture to an ethylene oxide absorber to produce an ethylene oxide stream and a treated gas stream comprising water and carbon dioxide;

d) providing at least a portion of the treated gas stream to a carbon dioxide absorber unit;

e) operating the carbon dioxide absorber unit to produce a recycle gas stream comprising carbon dioxide and water; and

f) combining at least a portion of the recycle gas stream from the carbon dioxide absorber unit with fresh feeds comprising oxygen and ethylene and at least a portion of a remaining portion, if any, of the treated gas stream, to form the reactor inlet gas mixture, wherein:

(i) a partial pressure of water vapor at the reactor inlet is at least 8 kPa; and

(ii) the partial pressure of water vapor at the reactor inlet is continuously maintained at least 8 kPa over a period corresponding to the production of at least 250 kmole of ethylene oxide per cubic meter of catalyst.

2. A method of producing ethylene oxide comprising:

a) providing to a reactor a reactor inlet gas mixture comprising ethylene, an oxygen-containing gas, one or more gas phase promoters, water and carbon dioxide, wherein the one or more gas phase promoters are organic chlorides, the components of the gas mixture subsequently being contacted within the reactor under epoxidation reaction

conditions with a catalyst comprising a catalytically effective amount of silver supported on a high purity carrier, a promoting amount of at least one Group IA metal, and a promoting amount of rhenium;

b) yielding from the reactor a reactor outlet gas mixture comprising ethylene oxide, ethylene, oxygen, water and carbon dioxide;

c) providing at least a portion of the reactor outlet gas mixture to an ethylene oxide absorber to produce an ethylene oxide stream and a treated gas stream comprising water and carbon dioxide;

d) combining at least a portion of the treated gas stream with fresh feeds comprising ethylene and providing at least a portion of the combined stream to a carbon dioxide absorber unit;

e) operating the carbon dioxide absorber unit to produce a recycle gas stream comprising carbon dioxide and water; and

f) combining at least a portion of the recycle gas stream from the carbon dioxide absorber unit with fresh feeds comprising oxygen and at least a portion of a remaining portion, if any, of the treated gas stream, to form the reactor inlet gas mixture,

wherein:

(i) a partial pressure of water vapor at the reactor inlet is at least 8 kPa; and

(ii) the partial pressure of water vapor at the reactor inlet is continuously maintained at least 8 kPa over a period corresponding to the production of at least 250 kmole of ethylene oxide per cubic meter of catalyst.

3. The method of claim 1 or 2, wherein the at least one Group IA metal comprises cesium and/or lithium.

4. The method of claim 1 or 2, wherein the at least one Group IA metal comprises cesium and lithium.

5. The method of any of claims 1-4, wherein the rate of ethylene oxide production per volume of catalyst is maintained or increased as compared to the rate of ethylene oxide production per volume of catalyst of the same catalyst under the same epoxidation reaction conditions except that the partial pressure of water vapor at the reactor inlet is less than 8 kPa.

6. The method of claim 5, wherein the rate of ethylene oxide production per volume of catalyst is increased as compared to the rate of ethylene oxide production per

volume of the same catalyst under the same epoxidation reaction conditions except that the partial pressure of water vapor at the reactor inlet is less than 8 kPa.

7. The method of any one of claims 3-6, wherein the selectivity of the reaction to ethylene oxide is maintained or increased as compared to the selectivity of the same catalyst under the same epoxidation reaction conditions except that the partial pressure of water vapor at the reactor inlet is less than 8 kPa.

8. The method of claim 7, wherein the selectivity of the reaction to ethylene oxide is increased as compared to the selectivity of the same catalyst under the same epoxidation reaction conditions except that the partial pressure of water vapor at the reactor inlet is less than 8 kPa.

9. The method of any one of claims 1 through 8, wherein the partial pressure of water vapor at the reactor inlet is no more than 60 kPa.

10. The method of any one of claims 1 through 9, wherein the catalyst is a high selectivity catalyst.

11. A method for making an ethylene glycol, an ethylene glycol ether, an ethylene carbonate or an ethanolamine comprising:

obtaining an ethylene oxide by a method for the production of ethylene oxide according to any one of claims 1-10; and

converting the ethylene oxide into an ethylene glycol, an ethylene glycol ether or an ethanolamine.