WE CLAIM

1. A method for selectively removing carbon dioxide (CO_2) from a mixed gas, comprising:

   (i) Contacting said mixed gas to a first side of a facilitated (FT) transport membrane which comprises a polymer having a complexing agent or carrier having affinity for CO_2 incorporated in said polymer and,

   (ii) Directing a steam sweep fluid produced by coolant fluid which has become hot via contact with said ICE to remove CO_2 complexed to said polymer from a second side of said FT membrane.

2. The method of claim 1, wherein said mixed gas is an exhaust gas produced by an internal combustion engine on a mobile device.

3. The method of claim 2, wherein said mobile device is an automobile, a truck, a bus, a motorcycle, a train, an airplane, or a ship.

4. The method of claim 1, wherein said FT membrane has higher selectivity for CO_2 as compared to N_2.

5. The method of claim 1, wherein said membrane has dense homogeneous morphology.

6. The method of claim 1, wherein said membrane has thin film composite morphology.

7. The method of claim 1, further comprising storing said CO_2.

8. The method of claim 1, further comprising knockdown of water from the sweep and/or permeate gas stream mixture.

9. A carbon dioxide separation system comprising:

   (i) an internal combustion engine;

(ii) a membrane module comprising a facilitated transfer membrane selectively permeable to CO_2;

(iii) a cooling means which contains a coolant and adapted to cool said internal combustion engine, wherein (i), (ii) and (iii) are positioned to provide;

(iv) a first flow path for directing exhaust gas produced by said internal combustion engine along a first side of said membrane module;

(v) a second flow path for directing steam, produced by action of cooling exhaust gas and/or said internal combustion engine coolant, along a second side of said membrane module opposite said first side;

(vi) a housing means for containing (i) through (v).

10. The carbon dioxide separation system of claim 9, further comprising a storage means for said separated CO_2.

CLAIMS

1. A method for selectively removing carbon dioxide (CO_2) from an exhaust gas, produced by an internal combustion engine (ICE) on a mobile device, said ICE being provided with coolant fluid, comprising:

   (i) contacting said exhaust gas produced by said ICE to a first side of a facilitated transport (FT) membrane, at a fixed feed pressure of 1.5 atmospheres, said FT membrane comprising a polymer having a complexing agent or carrier having affinity for CO_2 incorporated in said polymer, and,

   (ii) permeating gases from said second side of said FT membrane at a feed/permeate pressure ratio of 4 or greater to remove any CO_2 produced by said exhaust gas complexed to said polymer.

2. The method of claim 1, wherein said mobile device is an automobile, a truck, a bus, a motorcycle, a train, an airplane, or a ship.

3. The method of claim 1, wherein said FT membrane has CO_2/N_2 selectivity of about 400.

4. The method of claim 1, wherein said membrane has dense homogeneous morphology.

5. The method of claim 1, further comprising storing said CO_2 produced by said exhaust gas.

6. The method of claim 1, further comprising condensation of water from the permeating gases.

7. The method of claim 1, wherein said membrane has a thickness of 1.0 μm.

8. The method of claim 1, wherein said membrane has a thickness of 10.0 μm.

9. The method of claim 1, wherein said membrane has permeability for CO_2 of at least 1000 barriers.