CLAIMS

1. A useful hydrocarbon production method comprising:

a dry reforming step of generating a first gas containing carbon monoxide and hydrogen from a biogas containing carbon dioxide and a methane-containing hydrocarbon with a higher content than the carbon dioxide, using a dry reforming catalyst;

a useful hydrocarbon generating step of generating a second gas containing a useful hydrocarbon from the carbon monoxide and the hydrogen contained in the first gas, using a useful hydrocarbon generation catalyst; and

a recycling step of separating a carbon dioxide-containing gas from the second gas, and supplying the carbon dioxide-containing gas to the dry reforming step, wherein

the useful hydrocarbon is liquefied petroleum gas, and the useful hydrocarbon generation catalyst is a liquefied petroleum gas generation catalyst.

2. The useful hydrocarbon production method according to claim 1, wherein CO_2 concentration in the carbon dioxide-containing gas is 50% or more.

3. The useful hydrocarbon production method according to claim 1 or 2, further comprising a hydrogen supplying step of separating an off gas containing hydrogen from the second gas and supplying the off gas containing hydrogen to the useful

hydrocarbon generating step.

4. The useful hydrocarbon production method according to claim 3, wherein the hydrogen supplying step increases a supplied amount of the off gas containing hydrogen when a mole ratio (M_H/M_{CO}) of a mole number M_H of hydrogen relative to a mole number M_{CO} of carbon monoxide in the useful hydrocarbon generating step is small.

5. The useful hydrocarbon production method according to any one of claims 1 to 4, wherein the dry reforming catalyst contains at least one selected from Ir, Ru, Rh, Pt, Pd, Ni, Co and Fe.

6. The useful hydrocarbon production method according to any one of claims 1 to 5, wherein the dry reforming catalyst contains at least one selected from MgO, Al_2O_3, SiO_2, CeO_2, CaO, ZrO_2, TiO_2, La_2O_3, ZnO, silicalite-1, MCM-41 and SBA-15.

7. The useful hydrocarbon production method according to any one of claims 1 to 6, wherein the liquefied petroleum gas generation catalyst includes a methanol synthesis catalyst and a ZSM-5 type zeolite catalyst.

8. The useful hydrocarbon production method according to any one of claims 1 to 7, wherein a heating temperature of the dry reforming catalyst is 400°C or more and 1000°C or less.

9. The useful hydrocarbon production method according to any one of claims 1 to 8, wherein a heating temperature of the liquefied petroleum gas generation catalyst is 240°C or more and 350°C or less.

10. The useful hydrocarbon production method according to any one of claims 1 to 9, wherein a pressure of the useful hydrocarbon generating step is 2.0 MPa or more and 6.0 MPa or less.

11. The useful hydrocarbon production method according to any one of claims 1 to 10, further comprising a steam supplying step of supplying steam to the dry reforming step.