CLAIMS

[Claim 1]

A hydrogen production device, comprising a reactor that produces hydrogen by thermally decomposing a hydrocarbon gas, which is a feed gas, using a catalyst including fine metallic particles, the feed gas being introduced into the reactor through a lower portion of the reactor such that a fluidized bed of the catalyst is formed inside the reactor,

wherein inert particles serving as a fluidizing medium are mixed with the catalyst to increase fluidity of the catalyst, and

wherein new catalyst and new fluidizing medium are supplied to the reactor by a flow of a carrier gas, which is the same hydrocarbon gas as the feed gas, through a route separate from that of the feed gas.

[Claim 2]

The hydrogen production device according to claim 1, wherein

a pressure of the reactor is higher than atmospheric pressure,

the hydrogen production device further comprises:

a first supply device configured to supply fresh catalyst to the reactor;

a withdrawal device configured to withdraw catalyst having reduced activity from the reactor; and

a second supply device configured to supply the fluidizing medium to the reactor,

the first supply device is configured to pressurize the fresh catalyst to a pressure higher than or equal to the pressure of the reactor and continuously carry the fresh catalyst through pneumatic conveyance, and

the second supply device is configured to pressurize the fluidizing medium to a

pressure higher than or equal to the pressure of the reactor and continuously carry the fluidizing medium through pneumatic conveyance.

[Claim 3]

The hydrogen production device according to claim 2, wherein

the first supply device includes an activation device configured to activate the catalyst prior to activation by heating the catalyst while agitating the catalyst, and

the first supply device is configured to supply the catalyst activated by the activation device to the reactor.

[Claim 4]

The hydrogen production device according to claim 1, wherein the fresh catalyst and the fluidizing medium are supplied to the reactor by gravity feed.

[Claim 5]

The hydrogen production device according to claim 4, further comprising:

a first supply device configured to supply the catalyst to the reactor by gravity feed;

a withdrawal device configured to withdraw catalyst having reduced activity from the reactor; and

a second supply device configured to supply the fluidizing medium to the reactor by gravity feed, wherein

the first supply device includes an activation device configured to activate catalyst prior to activation by heating the catalyst while agitating the catalyst, and

the first supply device is configured to supply the catalyst activated by the activation device to the reactor.