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It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

Il est certifié par la présente qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule.

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Brevet européen n°

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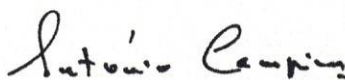
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PROCESS FOR THE PREPARATION OF BIOMETHANOL

Patentinhaber | Proprietor(s) of the patent | Titulaire(s) du brevet

Janhunen, Timo
Huopalahdentie 6 A9
00330 Helsinki
FI


António Campinos

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(54) **PROCESS FOR THE PREPARATION OF BIOMETHANOL**
VERFAHREN ZUR HERSTELLUNG VON BIO-METHANOL
PROCÉDÉ POUR LA PRÉPARATION DE BIOMÉTHANOL

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(73) Proprietor: **Janhunen, Timo**
00330 Helsinki (FI)

(72) Inventor: **Janhunen, Timo**
00330 Helsinki (FI)

(74) Representative: **Laine IP Oy**
Porkkalankatu 24
00180 Helsinki (FI)

(56) References cited:
US-A1- 2013 345 325

- **MARIO TOLEDO T. ET AL: "Syngas production from coal in presence of steam using filtration combustion", INTERNATIONAL JOURNAL OF HYDROGEN ENERGY, vol. 40, no. 19, 1 May 2015 (2015-05-01), AMSTERDAM, NL, pages 6340 - 6345, XP055959818, ISSN: 0360-3199, DOI: 10.1016/j.ijhydene.2015.03.022**
- **DAVID S NEWSOME: "The water-gas shift reaction", CATALYSIS REVIEWS: SCIENCE AND ENGINEERING, MARCEL DEKKER INC. NEW YORK, US, vol. 21, no. 2, 16 September 1980 (1980-09-16), pages 275 - 318, XP008176054, ISSN: 0161-4940, [retrieved on 20061205], DOI: 10.1080/03602458008067535**

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(52) Cooperative Patent Classification (CPC): (Cont.)

C-Sets

C07C 29/1518, C07C 31/04

Description

Field of invention

[0001] The present invention relates to a method according to the preamble of claim 1 for producing climate-friendly engine fuel.

Background

[0002] Global warming is the most significant problem the humankind is facing in 2021, and it is mainly related to the increase of CO₂-concentration in the atmosphere caused by combustion of fossil fuels. The aim is, for example, road traffic is to reduce CO₂ emissions by increasing the amount of electric cars, using hydrogen as fuel as well as synthetic, so-called e-fuels, the carbon of which is extracted from the atmosphere. Both of these methods, however, require large amounts of electric energy, whereby they are expensive methods.

[0003] Currently there are about 1.3 billion cars with internal combustion engine in the world, and most of them are relatively easy to convert to run on climate-friendly biofuels, such as biomethanol. An internal combustion engine does not cause global warming as such. Instead the culprit is the fossil carbon contained by the fuel of the engine that forms during combustion CO₂, which is a powerful greenhouse gas.

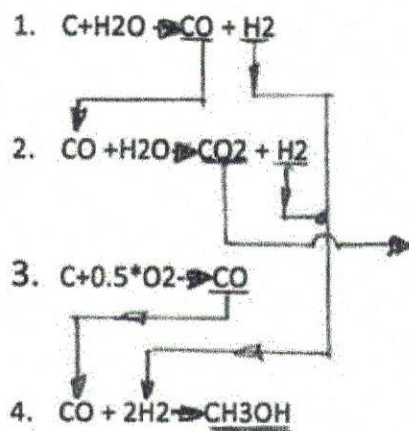
[0004] One example of producing methanol and hydrocarbons is disclosed in US 2013/0345325.

Purpose of the invention

[0005] When the fossil carbon contained by the fuel is replaced with renewable biocarbon, the CO₂ formed during combustion of fuel does not harm the atmosphere. The present invention is based on production of biocarbon-based biomethanol which can in many instances replace fossil carbon-containing engine fuels economically, thus considerably reducing the CO₂ load of the atmosphere.

Description of the invention

[0006] The present invention of producing biocarbon-based biomethanol is based on a novel way of producing climate-friendly biomethanol based on biocarbon, such as biocarbon pellets, to be used as engine fuel. The method is based on the following chemical reactions, in which the carbon is renewable biocarbon:



[0007] Reaction 1 is a reaction in which water vapour is introduced into glowing biocarbon ember. In reaction 2 the gas mixture is directed through catalysts in a temperature of, e.g. 400 C. In reaction 3 biocarbon is burned under oxygen-deficient condition. In reaction 4 biomethanol is formed by means of catalysts.

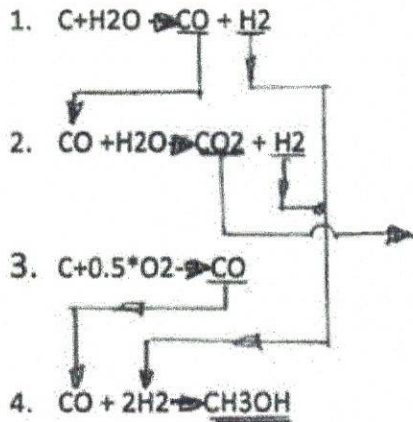
[0008] This reaction chain 1 to 4 based on biocarbon has never before been disclosed, it is a new and highly important method of producing climate-friendly CO₂-neutral biomethanol. In these reactions, no hydrogen is lost in reduction reactions.

[0009] In the method of the above-described reaction chain the production of climate-friendly biocarbon-based biomethanol the production of the fuel is based on the use of biocarbon, such as biocarbon pellets, whereby the use of the produced engine fuel is not harmful to the atmosphere, as the formed CO₂ is originally from renewable biocarbon. The methods and catalysts used in reactions 2 and 4 are known in the industry, and no expensive hydrogen is lost in reduction reactions in the production of biomethanol according to the reaction chain 1 to 4, and the CO₂ produced as a by-product is not harmful to the atmosphere as the carbon contained therein is renewable biocarbon.

[0010] When producing biocarbon-based biomethanol engine fuel according to the reaction chain 1 to 4 no hydrogen is lost in reduction in the production of biomethanol. Thus, the increase of CO₂ concentration in the atmosphere is reduced when using this fuel as engine fuel, because the CO₂ formed during combustion of the fuel is based on renewable biocarbon.

Claims

1. A method of producing engine fuel, the base materials being biocarbon and the reactions occurring according to the formula



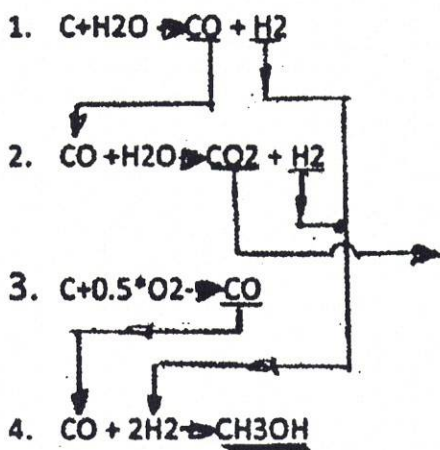
wherein:

in reaction 1 water vapour is introduced into glowing biocarbon ember,
in reaction 2 the gas mixture is directed through catalysts in a temperature of 400 °C,
in reaction 3 biocarbon is combusted in oxygen-deficient conditions and
in reaction 4 biomethanol is formed by means of catalysts, **characterized in that**

- in reaction 3 biocarbon is combusted with oxygen (O₂), and
- the hydrogen formed in reactions 1 and 2 is used in reaction 4.

Patentansprüche

1. Verfahren zum Produzieren von Motorkraftstoff, wobei die Basismaterialien Biokohlenstoff sind und die Reaktionen stattfinden gemäß der Formel



wobei:

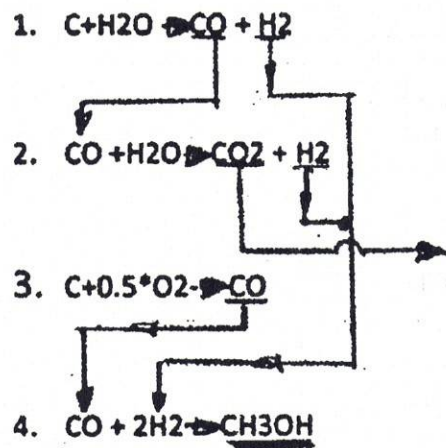
in Reaktion 1 Wasserdampf in glühende Biokoh-

lenstoffglut eingeleitet wird,
in Reaktion 2 das Gasgemisch bei einer Temperatur von 400 °C durch Katalysatoren geleitet wird,
in Reaktion 3 Biokohlenstoff unter sauerstoffarmen Bedingungen verbrannt wird und
in Reaktion 4 Biomethanol mittels Katalysatoren gebildet wird, die **dadurch gekennzeichnet sind, dass**

- in Reaktion 3 Biokohlenstoff mit Sauerstoff (O₂) verbrannt wird und
- der in den Reaktionen 1 und 2 gebildete Wasserstoff in Reaktion 4 verwendet wird.

Revendications

1. Procédé de production de carburant pour moteurs, dont les matières premières sont du biocarbonate et les réactions se déroulant selon la formule



dans lequel :

dans la réaction 1, de la vapeur d'eau est introduite dans une braise de biocarbonate incandescente,
dans la réaction 2, le mélange gazeux est dirigé à travers des catalyseurs à une température de 400 °C,
dans la réaction 3, le biocarbonate est brûlé dans des conditions pauvres en oxygène et
dans la réaction 4, le biométhanol est formé au moyen de catalyseurs, **caractérisés en ce que**

- dans la réaction 3, le biocarbonate est brûlé avec de l'oxygène (O₂), et
- l'hydrogène formé dans les réactions 1 et 2 est utilisé dans la réaction 4.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20130345325 A [0004]