VIENNA young SCIENTISTS SYMPOSIUM

STATE OF RESEARCH IN THE FIELD OF DUAL FLUIDIZED BED STEAM GASIFICATION OF BIOMASS WITH IN-SITU CO_2 CAPTURE

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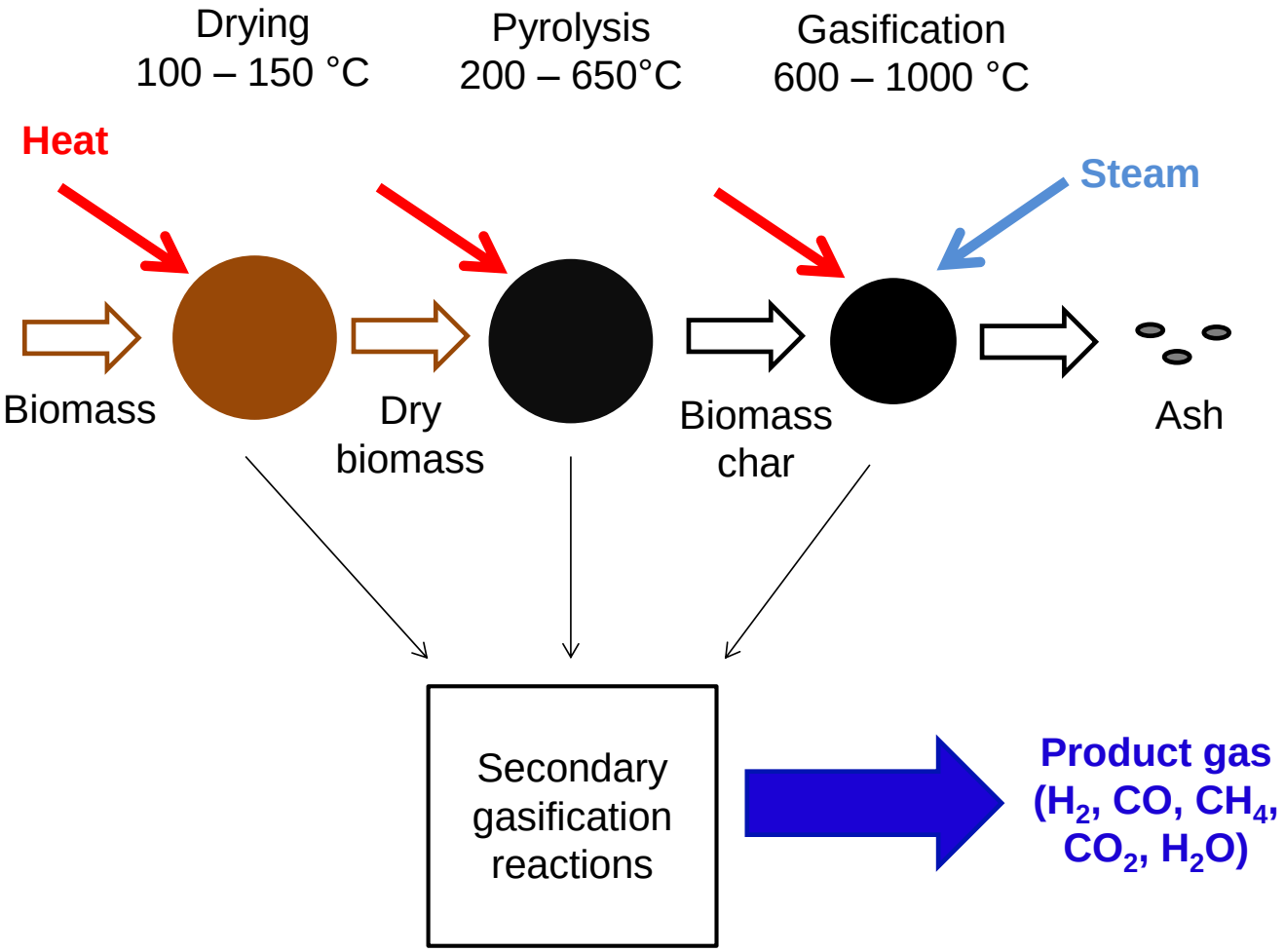
Combustion vs. Gasification

Fuel	Biogenics, wastes, etc.	Biogenics, wastes, etc.
Products	H_2O, CO_2	H_2, CO, CO_2, CH_4
Used for	Heat, Electrcity	Heat, Electricity, **Chem. Energy, Synthesis**

Gasification



Vision for gasification technologies

RESSOURCES

low grade wood chips

biogenic residues

industrial waste

homogenous municipal waste

sewage sludge manure

rising technological challenges with respect to gasification & gas cleaning

heat

electricity

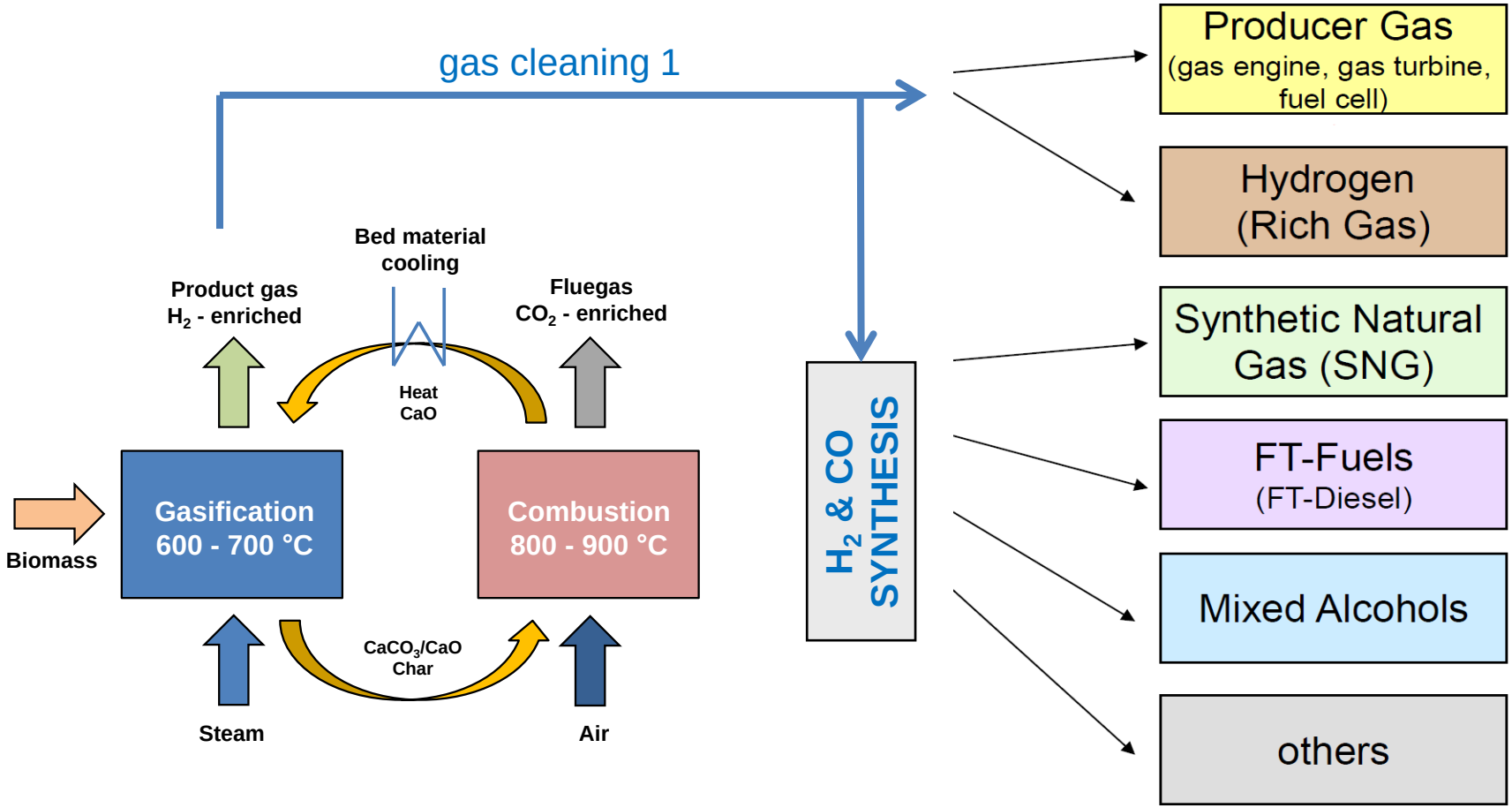
hydrogen

synthetic natural gas

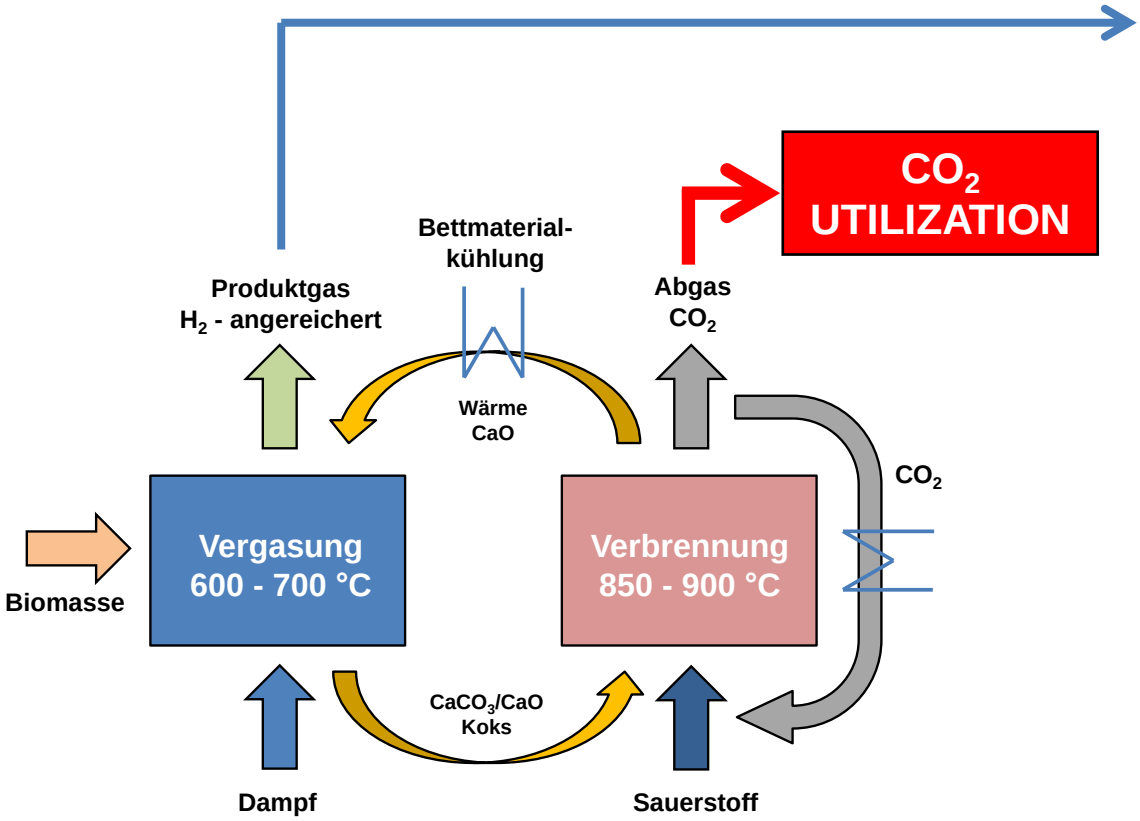
transportation fuels & basic chemicals

PRODUCTS

Sorption Enhanced Reforming



Sorption Enhanced Reforming with Oxyfuel



100 kW pilot plant TU Wien

Height: 7.5 m

Base area: 35 m^2 per floor (**2**)

105 **Temperatures**

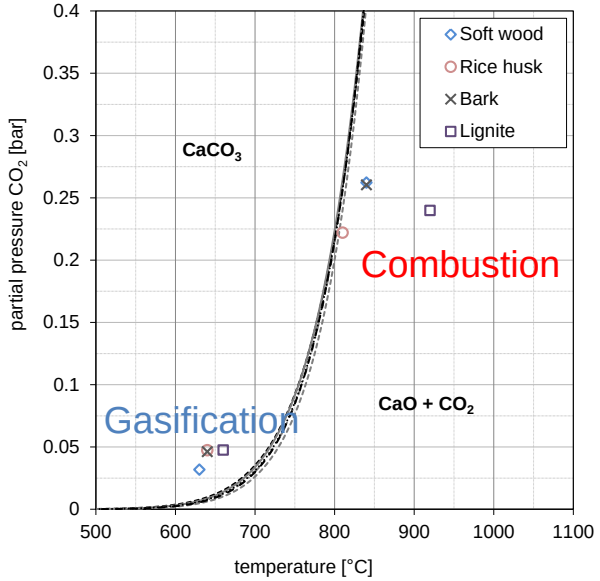
70 **Pressures**

13 **Volume/mass flows**

22 **Values of gas analyses**

Sorption Enhanced Reforming

Limestone bed material



$$CaCO_3 \leftrightarrow CaO + CO_2$$

Product gas composition

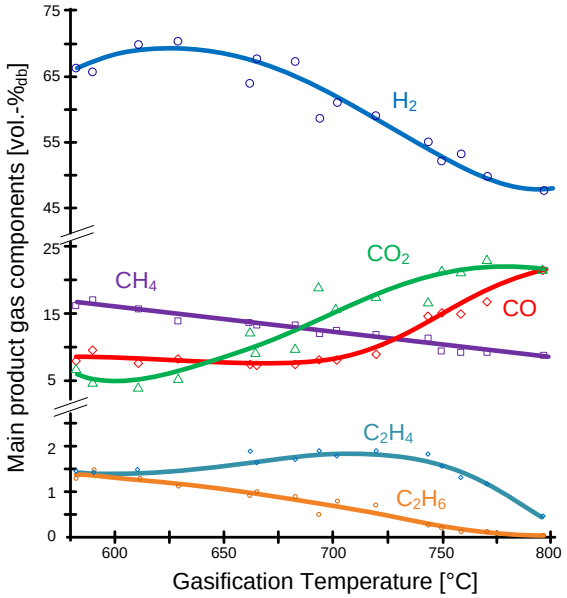
Le Chatelier's principle

$$H_2O + CO \leftrightarrow H_2 + CO_2 \quad WGS - Reaction$$

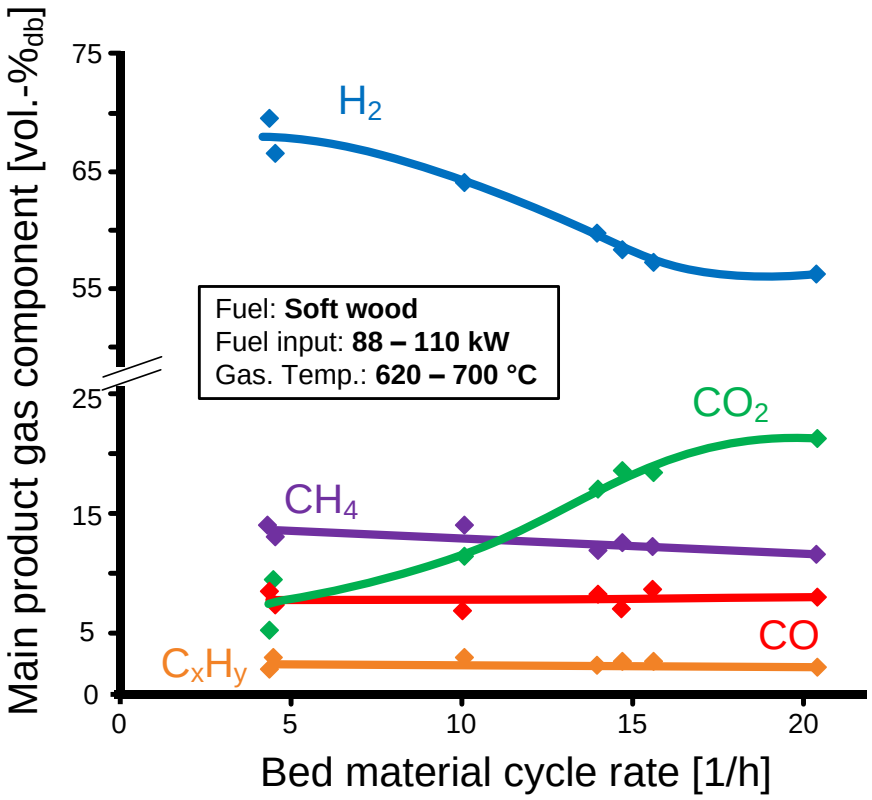
CO_2 removed continuously

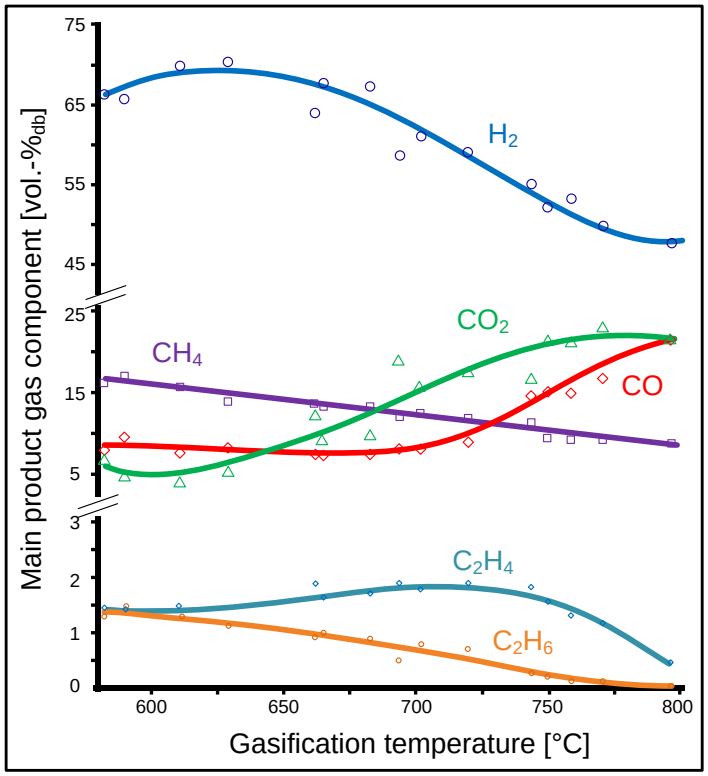
H_2 ↑

CO ↓

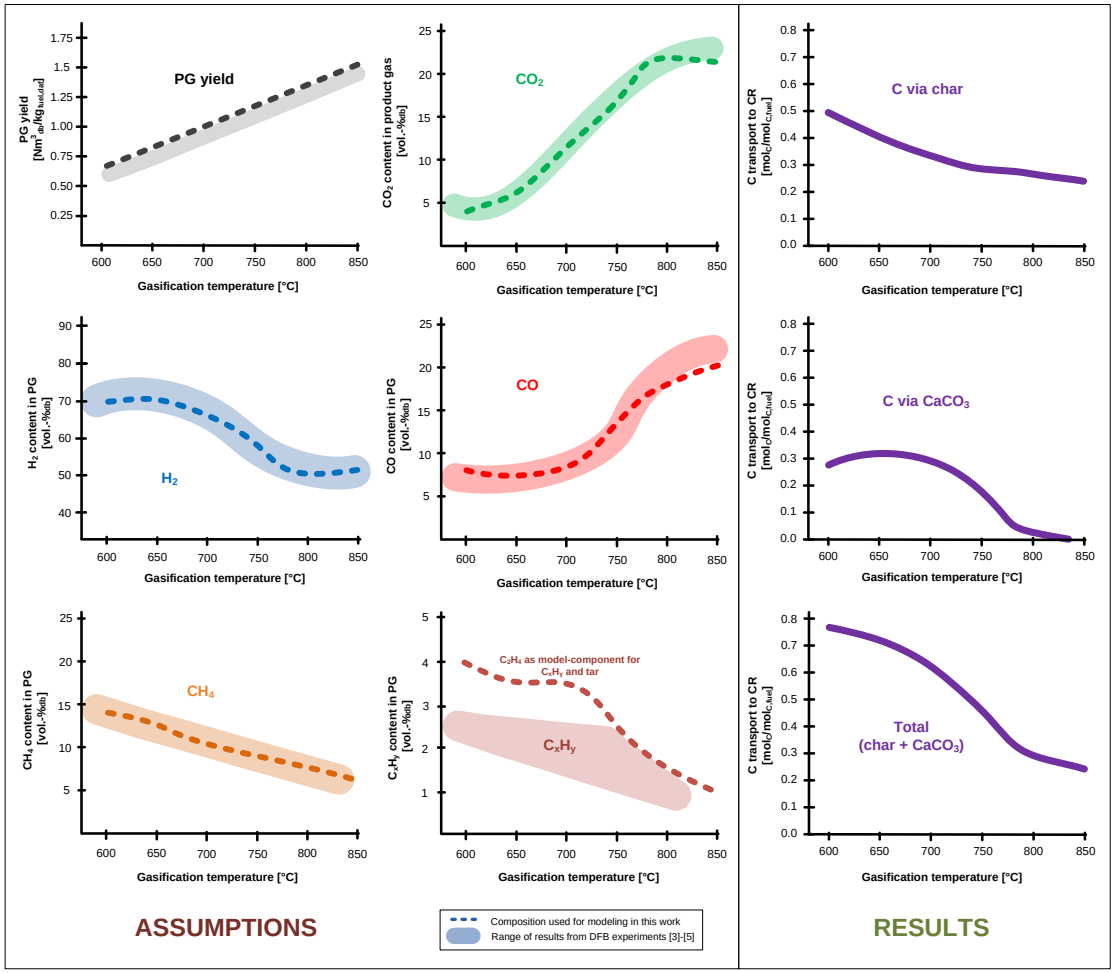


Sorption Enhanced Reforming





Modelling



$$\dot{N}_{i,fuel,in} + \dot{N}_{i,H2O,in} = \dot{N}_{i,PG,out} + \dot{N}_{i,H2O,out} + \dot{N}_{i,char,out} + \dot{N}_{i,CO2inCaCO3,out} \qquad i = C, H, O$$

$$\dot{N}_{C,PG,out} = Y_{PG} * \dot{m}_{fuel}/V_m * (y_{CO,PG} + y_{CO2,PG} + y_{CH4,PG} + 2 * y_{C2H4,PG})$$

$$\dot{N}_{H,PG,out} = Y_{PG} * \dot{m}_{fuel}/V_m * (2 * y_{H2,PG} + 4 * y_{CH4,PG} + 4 * y_{C2H4,PG})$$

$$\dot{N}_{O,PG,out} = Y_{PG} * \dot{m}_{fuel}/V_m * (y_{CO,PG} + 2 * y_{CO2,PG})$$

$$\dot{N}_{H,H2O,out} = \dot{N}_{H,fuel,in} + \dot{N}_{H,H2O,in} - \dot{N}_{H,PG,out}\,; \; \dot{N}_{O,H2O,out} = \dot{N}_{H,H2O,out}/2$$

$$\dot{N}_{O,CO2inCaCO3,out} = \dot{N}_{O,fuel,in} + \dot{N}_{O,H2O,in} - \dot{N}_{O,PG,out} - \dot{N}_{O,H2O,out}\,;$$

$$\dot{N}_{C,CO2inCaCO3,out} = \dot{N}_{O,CO2inCaCO3,out}/2$$

$$\dot{N}_{C,char,out} = \dot{N}_{C,fuel,in} - \dot{N}_{C,PG,out} - \dot{N}_{C,CO2inCaCO3,out}$$

Team

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