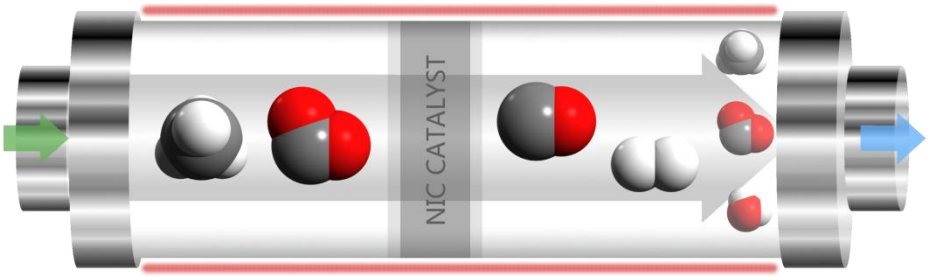
# Novel type of a transition metal catalyst for $CH_4$-$CO_2$ reforming




## Description

The invention refers to the novel transition metal catalyst intended for syngas production. The catalyst enables stable performance during long-time operation, with high activity and no coke accumulation.

## Advantages / Novelty

- performance at moderate temperatures with **high activity** and **no coking**
- does **not require** $H_2O$ addition to suppress coking
- **flexible** feed compositions
- **facile** synthesis method and **low-cost** precursors
- feasible **upscale**

## Research team

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## Applications

- improving the energy value of the introduced gaseous mixtures
- production of syngas as high quality feedstock for the synthesis of fuel, fuel additives and other chemicals from renewable sources

## Current stage of development

Laboratory tested - available for demonstration .

## Intellectual property

European patent pending
nr. EP14468002.2,
application date: 1st April 2014

## Collaboration type

We are looking for industrial partners and offer to grant patent license.

*See next page for more information.*

# Novel type of a transition metal catalyst for $CH_4$-$CO_2$ reforming

- **Detailed description**

The invention refers to the novel type of a transition metal catalyst for $CH_4$-$CO_2$ reforming with high activity and no coke accumulation. The catalyst enables stable long-term stability, high activity and prevents carbon accumulation.

Conventional catalysts for syngas production from methane and carbon dioxide show deactivation due to carbon accumulation. Current system use the excess of water addition and are not flexible in terms of dynamic feed composition variations. The carbon dioxide removal from the feed may be required and there is extensive coking present. Such systems cannot operate at low water and high carbon dioxide levels.



*Figure 1: Automatic computer-controlled multiphase catalytic reactor system (up to 950 °C and 100 bar) coupled to a GC apparatus for identification of products in gas-phase. Left - experimental setup. Right - detailed view of the heating element and the fixed bed reactor.*

The invention overcomes these problems by **producing a transition metal based multifunctional heterogeneous catalyst** is **composed of bimetallic nanoparticles and homogeneous solid solution of mixed metal oxide support**. The design of the catalyst enables the use of **feed with variable methane and carbon dioxide ratios**. Furthermore, the catalyst enables **stable functioning** of the process with **high activity** and **no coke accumulation**, tested for 400 h operation at 750 °C. Importantly, **no water addition is needed** to prevent carbon accumulation. Proprietary function of the catalyst **does not require high operational temperatures** (operating below 800 °C) in order to avoid carbon accumulation. Present catalyst is also suitable for **biogas reforming**, which is known to vary considerably in composition during the fermentation process.