Experimental infrastructure for energy conversion systems with CO_2 capture

1. EQUIPMENT NAME:

Circulating fluidised bed (CFB) laboratory kit

Research infrastructure in chemistry and chemical engineering,
Faculty of Chemistry and Chemical Engineering,
Chemical Engineering Department

YEAR: 2013

PRODUCER: Carboetalon, Romania

DESCRIPTION:

Circulating fluidized bed (CFB) laboratory kit for evaluation of chemical & calcium looping systems for post-combustion CO_2 capture. The pilot is composed of two vertical circulating fluidized bed reactors of about 1500 mm length and 30 mm diameter electrically heated and supplied with temperature and pressure sensors. The maximum operating temperature is 1000^{o}C at atmospheric pressure. The pilot can be used to evaluate the heterogeneous gas-solid systems operated in fluidized bed (e.g. catalytic and non-catalytic systems) being supplied with gas and solid sample prelevation systems (which then are analyzed with online gas analyzer or with gas chromatograph), cooler and condense separation, system monitoring and control using PLC and a dedicated computer (based on SCADA software data monitoring & control).

2. EQUIPMENT NAME:

Fixed bed laboratory kit for evaluation of energy conversion

Research infrastructure in chemistry and chemical engineering,
Faculty of Chemistry and Chemical Engineering,
Chemical Engineering Department

YEAR: 2014

PRODUCER: Carboetalon, Romania

DESCRIPTION:

Fixed bed laboratory kit for evaluation of energy conversion systems based on chemical looping with pre- and post-combustion CO_2 capture. The kit is composed of one fixed bed reactor of 1000 mm length and 30 mm diameter electrically heated and supplied with temperature and pressure sensors. The maximum operating temperature is 1000^oC at atmospheric pressure. The pilot can be used to evaluate the heterogeneous gas-solid systems operated in fixed bed (e.g. catalytic and non-catalytic systems) being supplied with gas sample prelevation systems (which then are analyzed with online gas analyzer or with gas chromatograph), cooler and condense separation, system monitoring and control using PLC and a dedicated computer (based on SCADA software data monitoring & control).

3. EQUIPMENT NAME:

Fixed bed laboratory kit for evaluation of gaseous and liquid fuels conversion systems based on chemical looping

Research infrastructure in chemistry and chemical engineering,
Faculty of Chemistry and Chemical Engineering,
Chemical Engineering Department

YEAR: 2016

PRODUCER: Carboetalon, Romania

DESCRIPTION:

Fixed bed laboratory kit for evaluation of gaseous and liquid fuels conversion systems based on chemical & calcium looping with pre- and post-combustion CO_2 capture. The pilot is composed of one fixed bed reactor of 300 mm length and 10 mm diameter electrically heated and supplied with temperature and pressure sensors. The maximum operating temperature is 1000^oC at atmospheric pressure. The kit is provided with a system (dosing pump + vaporisator) which enables the usage of liquid fueld as well as an electrical steam generator for oxygen carrier reoxidation. The pilot can be used to evaluate the heterogeneous gas-solid systems operated in fixed bed (e.g. catalytic and non-catalytic systems) being supplied with gas sample prelevation (which then are analyzed with online analyzer or gas chromatograph), cooler and condense separation, system monitoring and control using PLC and a dedicated computer (based on SCADA software data monitoring & control).

4. EQUIPMENT NAME:

Online gaseous analyser

Research infrastructure in chemistry and chemical engineering,
Faculty of Chemistry and Chemical Engineering,
Chemical Engineering Department

NAME: Siemens Ultramat 23 (IR detector) and Siemens Calomat 6 (TCD detector)

YEAR: 2013

PRODUCER: TechnoInstrument, Romania

DESCRIPTION:

Online gaseous analyzer with TCD and IR detectors dedicated to continuous monitoring of following gaseous compounds: carbon dioxide, carbon monoxide, methane and hydrogen from process gases. The equipment can be used for continuous monitoring of above-mentioned gaseous compounds from various lab and pilot experiments (the experimental kits for energy conversion systems with CO_2 capture presented above) being supplied with sample prelevation system, cooler and condense separation, monitoring and control using portable computer (laptop).

5. EQUIPMENT NAME:

Gas chromatograph

Research infrastructure in chemistry and chemical engineering,
Faculty of Chemistry and Chemical Engineering,
Chemical Engineering Department

NAME: Clarus 580 GC, model Arnel 4017PPC

YEAR: 2012

PRODUCER: Perkin Elmer, USA

DESCRIPTION:

Gas chromatograph with TCD and FID detectors specially dedicated to analysis of gaseous compounds resulted from various industrial processes e.g. energy conversion systems such as gasification and reforming processes, oil refineries, combustion systems etc. (carbon

dioxide, carbon monoxide, methane, ethane, hydrogen, nitrogen, oxygen, acetylene, hydrogen sulphide). The equipment can be used for analysis of gaseous and liquid samples (for liquid samples, there is a limitation to a maximum 180^{o}C boiling point due to valves from the oven specialy designed for industrial gases).

NAME: Portable online gas analyzer
YEAR: 2021
PRODUCER: Multilab, Romania
DESCRIPTION:

Portable online gaseous analyzer with TCD and IR detectors dedicated to continuous monitoring of following gaseous compounds: carbon dioxide, carbon monoxide, methane and hydrogen from process gases. This mobile equipment can be used for continuous monitoring of above-mentioned gaseous compounds from various lab and pilot experiments (the experimental kits for energy conversion systems with CO_2 capture presented above) being supplied with sample conditioning system, cooler and condense separation, monitoring using portable computer (laptop) via USB or Wi-Fi connections.

These research facilities can be used by other interested groups involved in advanced energy conversion systems in accordance to the laboratory working plan, on-going testing campaigns and general access conditions in the Faculty of Chemistry and Chemical Engineering (Monday to Friday between 8:00 to 20:00). The experimental and computational research facilities are used for didactic and research activities at bachelor, master and doctoral levels for catalytic and non-catalytic heterogenous systems.

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