Biogas robust processing with combined catalytic reformer and trap: BioRobur Project

Montenegro Camacho. Y. S.[a], Bensaid S.[a], Fino D.[a], Trimis D.[b], Herrmann A.[b], Guilhaume N.[c], Schuurman Yves[c], Konsatndopoulos A. G.[d], Lorentzou S.[d], , Gianella S.[e], Antonini M.[f], Marchisio L.[f], Ortona A.[g], Khinsky A.[h]

[a]*Politecnico di Torino, Department of Applied Science and Technology, Torino – Italy*
Corresponding author: debora.fino@polito.it
[b]*TU Bergakademie Freiberg – Institute of Thermal Engineering, Freiberg – Germany*
[c] *Université Lyon 1, Institut de Recherches sur la Catalyse et l'Environnement de Lyon, Lyon-France*
[d]*Aerosol and Particle Technology Laboratory, CERTH-CPERI, Thessaloniki - Greece*
[e]*Erbicol SA, Balerna – Switzerland*
[f]*Hyxytech srl, Torino - Italy*
[g]*ICIMSI-SUPSI, Manno – Switzerland*
[h]*Amiagus Rtd., Kaunas - Lithuania*

…t work summarizes experimental results obtained until a pilot plant scale within the …f the project Biorobur (Figure 1). The project is financed by the European Commission …ve project and the main objective of the BioRobur project is the development and … and efficient fuel processor based on direct autothermal reforming (ATR) of biogas, …t a scale equivalent to 50 Nm^3/h hydrogen production. One of the most important …e attainment of an overall efficiency of the conversion of biogas to hydrogen of 65%. …ig proved by adequate model calculations and by running tests in the designed …ration plant. Furthermore, the overall originality of the project is the use of structured catalyst …e ATR reaction, which is based on high thermal conductivity cellular materials to disperse the …eat axially in the reactor, and the adoption of a novel approach to retain particulate matter emissions in a catalytic wall-flow trap based on transition metal catalysts, downstream from a biogas ATR, which could entail effective filtration and conversion of soot particles eventually generated in the inlet part of the reformer during steady or transient operation, the decomposition of traces of incomplete reforming products. Modelling and simulation were carried out to select the catalyst support with promising results for the BioRobur fuel processor and furthermore, 2D CFD analysis were used to examine flow uniformity issues due to Soot Trap integration. Safety studies and life cycle analysis of the overall process also are being conducted.

Nickel supported on mixed oxides, perovskites and spinels were synthesized for the ATR reaction. 5-0.05 wt.% Ni-Rh/ $MgAl_2O_4$ catalyst showed full methane conversion over 200 hours with a constant hydrogen production. Moreover, delafossite catalysts were prepared and investigated under realistic conditions as catalysts for the gasification of particulate matter retained in the soot trap. $LiFeO_2$ and $LiCoO_2$ catalysts exhibited the best performance.

The partners involved in the Biorobur project bring together a sufficient number of important European actors on the scientific, research and industry level.

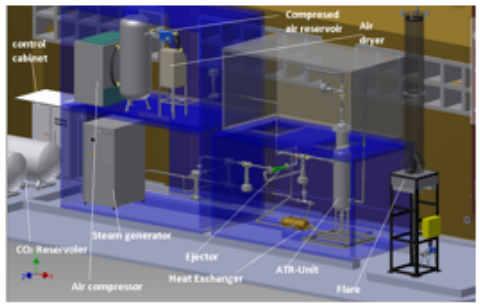

Figure 1. Rendering of the BioRobur pilot plant