INTRODUCTION

Power-to-Gas (PtG or P2G) has the potential to reduce CO₂ emissions, obtaining as product H₂ and CH₄ (Synthetic Natural Gas, SNG) [1]. SNG would be able to fulfill the requirements to be injected into the preexisting natural gas network. Thus, PtG technologies might produce an alternative energy vector easy to store and transport.

The CO₂ hydrogenation is carried out in a catalytic bed by the Sabatier reaction (r.1). Catalyst cost is a determinant variable for the scale-up in the methanation process. In this work, the influence of adding a CO₂ adsorbent on the Fe-Ni catalytic bed in order to improve the reactants interaction [2] is studied.

Experiments are performed in a fixed bed reactor with the characteristics showed in Table 1. Results presented on the graphs were measured by gas chromatography and a FTIR gas analyzer [3].

RESULTS

Figure 1. CH₄ production reproducibility of FeNi+CaO catalyst experiments carried out in the fixed bed reactor.

Figure 2. CH₄ and intensification rate referred to FeNi (mmol CH₄ generated with FeNi-adsortent/mmol CH₄ generated with only FeNi).

CONCLUSIONS

Results show a high reproducibility during the different repetitions of the experiment.

The inclusion of the CaO in the reactor bed improved the methane production by 40%. Meanwhile, the intensification for the Na₂O elevated the methane production by 60%.

As general conclusion, both adsorbents showed their potential to enhance the methanation reaction performed by adsorption followed by hydrogenation.