

ABSTRACT

1. **Title:** Hydrogen purification with hydrogen selective ceramic membranes
2. **Student:** Gonzalo Miguel
3. **Supervisor:** Esther Acha. Email: esther.acha@ehu.es
4. **University:** University of the Basque Country (UPV-EHU)-Faculty of Engineering
5. **Sponsor:** Naturgas Energia
6. **Summary**

There will be a transition between nowadays energy structure and the situation in which hydrogen, which is foreseen by many as an important energy carrier in the future sustainable energy society, becomes an important part of it. In this transition the use of existing natural gas pipelines infrastructure to transport hydrogen will be profitable. Hydrogen can be produced by different ways. There are sustainable processes, as water electrolysis from excesses from solar and wind energy. In other processes, as natural gas or biomass reforming, hydrogen is generated mixed with other compounds as CH_4 , CO , CO_2 , N_2 , etc. It is necessary to purify this hydrogen for two main reasons. First of all, pure hydrogen is needed to be converted by fuel cells into electricity with high efficiencies and very low pollutant emissions. Secondly, it is advisable to not introduce undesired gases in the pipelines. In this scenario with the use of natural gas pipelines, hydrogen purification units will also be needed to separate hydrogen from natural gas, due to the fact that they usually have different uses.

For separating hydrogen from a mixture there are different techniques: PSA, which is widely used in the industry and hydrogen selective membranes, which are the promising future and the aim of this study. Pd based ceramic membranes were tested to analyse the hydrogen permeance, purification, capacity and the influence of thermal cycles at 673 K and 2 bars of pressure difference. Membranes were characterized with SEM images before and after the tests to observe the influence in surface morphology.