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## A sequential process for hydrogen production based on continuous HDPE fast pyrolysis and in-line steam reforming

Itsaso Barbarias, Gartzzen Lopez\*, Jon Alvarez, Maite Artetxe, Aitor Arregi, Javier Bilbao and Martin Olazar

Department of Chemical Engineering University of the Basque Country UPV/EHU, P.O. Box 644 - E48080 Bilbao (Spain). [gartzzen.lopez@ehu.es](mailto:gartzzen.lopez@ehu.es)

### Abstract

A continuous process has been developed consisting in the flash pyrolysis (500 °C) of high density polyethylene (HDPE) in a conical spouted bed reactor (CSBR) followed by steam reforming in a fluidized bed reactor (Ni commercial catalyst). The effect reforming temperature in the 600-700 °C range, space time from 2.8 to 20.8  $\text{g}_{\text{cat}} \text{min g}_{\text{HDPE}}^{-1}$  and steam/plastic ratio between 3 and 5 have on product yields and gas composition has been studied. The continuous pyrolysis-reforming process performs well, with no operational problems and attaining complete HDPE conversion. Under the optimum conditions, i.e., 700 °C, space time 16.7  $\text{g}_{\text{cat}} \text{min g}_{\text{HDPE}}^{-1}$  and steam/plastic of ratio 5, the H<sub>2</sub> yield was 92.5 % of that corresponding to stoichiometry, which accounts for a H<sub>2</sub> production of 38.1 g per 100g of HDPE in the feed.

**Keywords:** hydrogen; pyrolysis; reforming; plastic waste; conical spouted bed; Ni catalyst

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