

## عنوان مقاله:

Hydrogen Production Using Liquid Hydrocarbon Cracking through Pulsed DBD Plasma Reactor

## محل انتشار:

هفتمین کنگره ملی مهندسی شیمی (سال: 1390)

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## خلاصه مقاله:

In this present, conversion of a model refinery cut (Naphtha) in a novel pulsed DBD plasma reactor was investigated in laboratory scale using high voltage pulse generator. Continuous hydrocarbons cracking and instant generation of light hydrocarbons (C1–C3 like CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> and C<sub>3</sub>H<sub>6</sub>,) and H<sub>2</sub> were studied at room temperature and atmospheric pressure by using argon as a plasma carrier gas. Finding the optimal design parameters of liquid hydrocarbons cracking was the main purpose of this study. So effect of some process parameters like applied voltage and frequency (applied power) and feed flow rate was investigated on content and quality of products. energy efficiencies, generation of hydrogen, product selectivity, breakdown voltage and etc. were determined and discussed. Results show that, compared with frequency, applied voltage has dominant effect on power consumption. Also higher feed flow rate, increase power consumption. Applied voltage, applied frequency and feed flow rate, all affect the energy efficiency of the plasma reactor. It will increase as the feed flow rate decreases and increase as applied voltage and frequency increase. The best performance in reaching notably high efficiencies was at 7 KV and 18 KHz. In this condition efficiency rise to 79.38 (lit/KWh) for 1ml/min of feed injection. Hydrogen gas concentration was between 30%-60% in the produced gas. The hydrogen output is significantly affected by applied voltage and frequency. The generation rate of the hydrogen gas was 2.76 ml/min for an input energy of 5.38 W with energy efficiency of 51.08 lit/kWh which H<sub>2</sub> concentration was 60.3% (maximum). The results showed that pulsed DBD systems are capable for cracking liquid hydrocarbon with high conversion efficiency and are an important piece of technology for replacement refinery cracking operations. It is also a very promising process for the production of hydrogen-rich gas with the important advantage to be free of carbon monoxide thus it can be considered as a high-quality hydrogen production method.

## کلمات کلیدی:

plasma reactor, pulsed DBD, Hydrocarbon conversion, Hydrogen production & cracking process

