Steam Cracking of Naphtha in a Novel Reactor

Ramin Karimzadeh, Jafar Towfighi
Chemical Engineering Department, Tarbiat Modares University ,Po.Box. 14115-111 , Tehran, Iran, email : ramin@modares.ac.ir
Heinz Zimmermann
LINDE AG, Process Engineering and Contracting Division, Dr. Carl-von-Linde-Str. 6-14 ,D-82049 Hoellriegelskreuth , Germany

Abstract
Because using of packed bed reactors in commercial scale has pressure drop limitation, a novel reactor consisting of a coil with ceramic tube or rod inside the coil was investigated for steam cracking of naphtha. Steam cracking of naphtha in a laboratory-scale reactor has been compared with steam cracking in a packed bed reactor and with an empty tube. The yields of light products of steam cracking of naphtha have been increased through a tube with ceramic packing, ceramic tube or ceramic rod in comparison with steam cracking of naphtha through an empty tube. Maximum yield of ethylene is achieved through the reactor consisting of a ceramic tube or rod in diameter of 12.3 mm. The results of steam cracking with a reacotr containing a ceramic rod or tube are in similar range as the results in packed bed reactor.

Keywords : **Steam Cracking, Ceramic rod , Naphtha, Olefin, Ethylene**

1. Introduction
Light Olefins, ethylene and propylene, are produced commercially via steam cracking of various hydrocarbons, such as ethane, naphtha and gas oil. These low molecular weight olefins are among the most important base chemicals for the petrochemical industry.
Modern steam cracking plants today typically are the center of petrochemical complexes producing 500,000 - 1,000,000 tons per year ethylene the main petrochemical building block. Ethylene yield on weight basis is typically 30 % with naphtha feed stock and goes down to 25 % for gas oil feed stock.
Different catalysts were used to improve the yield of light olefins and to decrease the process temperatures [1,2,3,4]. However Golombok et.al.[5] have shown that increased light olefin yields during catalytic steam cracking are mainly due to a surface / volume effect and are not due to a catalytic effect.
Towfighi et.al. [6] investigated several different metal oxide catalysts and inert ceramic packing in different size diameters. In these experiments it was shown that the improvement of yields over the inert ceramic materials are in a similar range as with the catalysts. Also it was shown that the yield of products are in similar range with different surface area of inert material packing. However using packing materials in industrial scale provide high pressure drop and coke formation on the surface of packing. The work reported in the present paper is aimed