

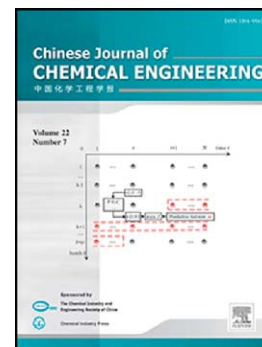
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Study on co-cracking performance of different hydrocarbon mixture in a steam pyrolysis furnace

Benfeng Yuan^{1,2}, Jinlong Li^{2*}, Wenli Du¹, Feng Qian^{1*}

1 Key Laboratory of Advanced Control and Optimization for Chemical Processes, Ministry of Education, East China University of Science and Technology, Shanghai, China, 200237

2 School of Information Science and Technology, East China University of Science and Technology, Shanghai, China, 200237

Abstract: Co-cracking is a process where the mixtures of different hydrocarbon feedstocks are cracked in a steam pyrolysis furnace, and widely adopted in chemical industries. In this work, the simulations of the co-cracking of ethane and propane, and LPG and naphtha mixtures have been conducted, and the software packages of COILSIM1D and SimCO are used to account for the cracking process in a tube reactor. The effects of the mixing ratio, coil outlet temperature, and pressure on cracking performance have been discussed in detail. The co-cracking of ethane and propane mixture leads to a lower profitability than the cracking of single ethane or single propane. For naphtha, cracking with LPG leads to a higher profitability than single cracking of naphtha, and more LPG can produce a higher profitability.

Keywords: Co-cracking; mixing ratio; coil outlet temperature; coil outlet pressure; pyrolysis furnace

1. INTRODUCTION

Ethylene and propylene are important raw materials of the petrochemical industries for other chemical products and mainly produced by the cracking of petroleum distillates. The cracking is a process where the different hydrocarbons are transformed into light hydrocarbons such as paraffin, olefin and so on in a steam pyrolysis furnace (thereafter called furnace). At present, there are several different cracking routines applied in the industries^[1], such as catalyst cracking^[2,3], hydrocracking and steam cracking.

The steam cracking has a wide range of applications in the chemical industries, and it is also the most energy-consuming process in chemical industries. It is found that the radiation section of a furnace consumes approximately 65% of total process energy^[4]. In a furnace, a gaseous or liquid hydrocarbon feedstock like naphtha, LPG, ethane and propane is thermally cracked with steam instead of oxygen. At present, the naphtha is a widely used feedstock and its consumption continues to increase in china. Nowadays, it is one of the most important feedstocks of the industrial furnace^[5].

A steam pyrolysis furnace is mainly composed of two sections: a convection section and a radiation section. Some investigations have been performed in the convection section^[6], however, more attention has been paid to

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To whom correspondence should be addressed. E-mail: fqian@ecust.edu.cn; lijl@ecust.edu.cn

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