

ETHYLENE PRODUCTION VIA CRACKING OF ETHANE-PROPANE

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ABSTRACT

BACKGROUND

Ethylene (IUPAC name: ethene) is a hydrocarbon which has the formula C_2H_4 or $H_2C=CH_2$. It is a colourless flammable gas with a faint "sweet and musky" odour when pure. Ethylene is widely used in the chemical industry, and its worldwide production (over 150 million tonnes in 2016) exceeds that of any other organic compound. Ethylene is a critical building block for the petrochemical industry. It is usually produced in steam-cracking units from a range of petroleum-based feedstocks, such as naphtha, and is used in the manufacture of several major derivatives.

The most commonly used process for ethylene production from an ethane-propane mixture is steam-cracking process. The process can be divided into three main parts: cracking and quenching; drying; and separation.

DESCRIPTION OF THE FLOWSHEET

Ethylene is formed by the steam cracking of ethane.

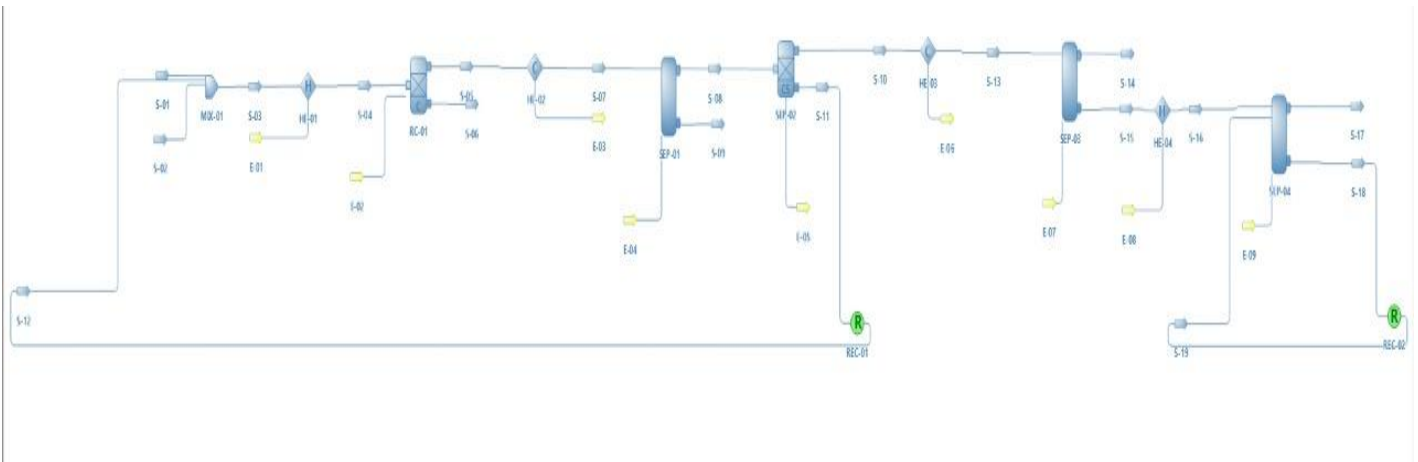
Here we are taking a mixture of ethane and propane in stream 1 and is diluting it with water. Further we are raising the temperature to $750-850^{\circ}C$. At this temperature, ethane converts into ethylene and propane will convert into propylene. We will get hydrogen as a by-product too. After this the feed is dried. Then we separated hydrogen which we can use separately, then ethylene is further purified and ethane -propane are removed and recycled. Finally, we will remove propylene also. We can get purified propylene as well. But here our aim is to get ethylene, so we are restricting our flowsheet to its purification.

Cracking of ethane: $C_2H_6 \rightarrow C_2H_4 + H_2$

SYSTEM OF UNITS

All units are in SI.

FLOWSHEET



RESULT

Master Property Table						
Object	S-18	S-17	S-14	S-11	S-09	
Temperature	188.152	188.152	73.15	298.15	298.15	K
Pressure	101325	101325	101325	101325	101325	Pa
Molar Flow	70.5262	0.293196	0.993406	0.173396	1.02313	mol/s
Molar Fraction (Mixture) / Ethane	0	0	0	0.31637	0.000614513	
Molar Fraction (Mixture) / Propane	0	0	0	0.303441	0.00258651	
Molar Fraction (Mixture) / Ethylene	0.339319	0.908094	1.91573E-07	0.000288024	2.72609E-06	
Molar Fraction (Mixture) / Propylene	0.66068	0.0805938	6.08361E-12	0.00027541	0.0194056	
Molar Fraction (Mixture) / Hydrogen	4.5679E-07	0.0113118	1	0.000574883	6.63142E-06	
Molar Fraction (Mixture) / Water	0	0	0	0.379051	0.977384	

REFERENCE

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