PRODUCTION OF DIETHYL ETHER FROM ETHANOL BY DEHRATION

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INTRODUCTION

Diethyl ether (C2H5)2O is an organic compound which is also known as ethyl ether, ether or ethoxyethane. It is a colourless, highly volatile flammable liquid with a characteristic odour. It is commonly used as a solvent and as a general anesthetic. It has narcotic properties so it has been known to cause temporary psychological addiction, sometimes referred to as etheromania.

Diethyl ether may have been created by either JabiribnHayyan in the 8th century or RaymundusLullus in 1275, as there is no any evidence of this. It was first synthesized in 1540 by ValeriusCordus, who called it “sweet oil of vitriol” (oleum dulcevitrioli) - the name reflects the fact that it is obtained by distilling a mixture of ethanol and sulfuric acid (then known as oil of vitriol). At about the same time, Paracelsus discovered the ether’s analgesic properties in chickens. The ether name comes in 1730 by August Sigmund Frobenius.

DESCRIPTION OF THE FLOWSHEET

The flowsheet for the Diethyl ether production consist of a mixer to mix the recycle stream (ethanol) and Ethanol feed stream,Conversion reactor and two Distillation columns .One distillation column is to purify diethyl ether and later is for seperating water and recycle stream.About 50% conversion is obatined in the conversion reactor with reaction as follows

$$2\ C_2H_5OH \longrightarrow (C_2H_5)_2O + H_2O$$

The product from the mixer is sent to the coversion reactor ,the product from the reactor is sent to the Distillation column 1 to seperate pure Diethyl ether and mixed bottom which is a feed to the Distillation column 2 where recycle ethanol stream and water are being seperated. All the streams are at Atmospheric pressure.

Results obtained from the flowsheet

OBJECT	WATER	ETHANOL REC	ETHANOL FEED	DIETHYL ETHER	Bottoms1
TEMPERATURE (^{o}C)	99.6033	74.4518	40	34.7458	76.4117
PRESSURE (bar)	1.01325	1.01325	1.01325	1.01325	1.01325
MOLAR FLOW (kmol/hr)	41.2149	74.7231	72	30.801	115.938
Molar Fraction (mix)/Diethyl ether	1.34319E-19	0.0250525	0	0.99	0.0161466
Molar Fraction (Mixture) /Ethanol	0.001	0.811268	0.85	0.00767802	0.523226
Molar Fraction (Mixture) /Water	0.999	0.163679	0.15	0.00232198	0.460628

Properties of Diethyl Ether

Molecular formula : C4H10O
Molecular weight : 74.12gm/mole
Appearance : Colourless liquid
Odour : Penetrating ethereal odour
Boiling point : 34.60C at 0.101kPa
Melting point : -116.00C
Flash point : -40.00C
Autoignition temperature : 1600C
Density : 0.71gm/cm3 at 200C
Refractive index : 1.353 at 200C
Solubility : Miscible with water

References

Flowsheet : https://www.cocosimulator.org/index_sample.html
OR https://www.cocosimulator.org/downloads/FlowsheetingWithCOCOandChemsep.gif

Thoery : http://nptel.ac.in/courses/103106109/31-40/Lecture%2040%20Diethyl%20ether.pdf