

EXTRACTIVE DISTILLATION OF DIMETHYL CARBONATE AND ETHANOL

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➤ PROBLEM STATEMENT:

Extractive Distillation of Dimethyl Carbonate (DMC) and Ethanol (EtOH) by using p-Xylene (PX) as a entrainer.

➤ SYSTEM OF UNIT:

The unit used in this flowsheet is custom unit number 5 in which temperature is in °C, pressure is in bar and molar flow is in Kmol/h

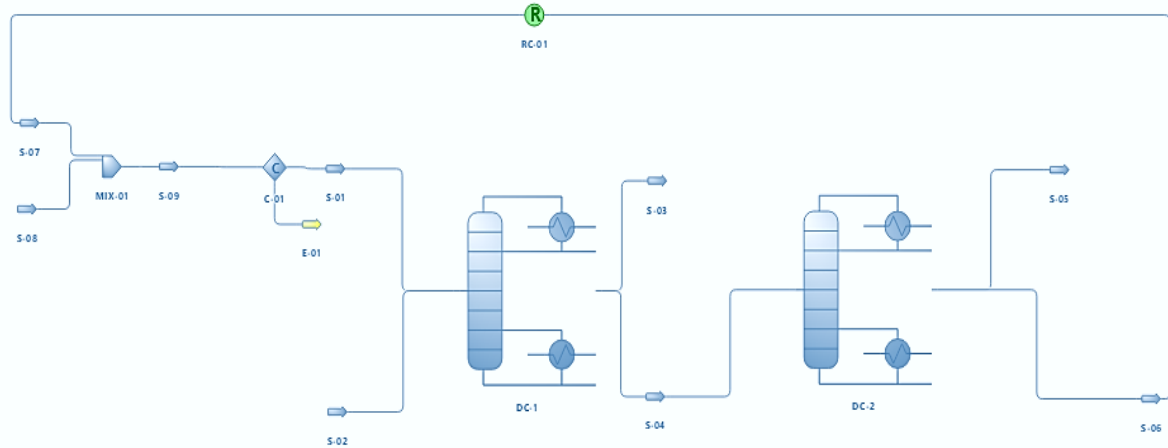
➤ DESCRIPTION:

I. Abstract:

DMC and EtOH as important solvents are frequently generated in synthesis of diethyl carbonate or methyl ethyl carbonate, which are required to be separated to avoid causing environmental issues. However, the mixture of DMC/EtOH could not be separated via the conventional distillation because it could form minimum azeotrope at atmosphere pressure. According to the report of Gao's group, p-xylene (PX) is determined as the best entrainer among PX, butyl propionate and isobutyl acetate to separate EtOH/DMC via the extractive distillation.

II. Flowsheet Description:

Extractive distillation column (EDC) with 65 theoretical trays and entrainer recovery column (ERC) with 40 theoretical trays are both operated at 1.0 bar. Entrainer and fresh feed are fed to 27th and 51th stages of the EDC, respectively. The azeotrope of DMC/EtOH could be broken in the extractive distillation section (from 27th to 51th stages in EDC) and then the EtOH is distilled as the overhead product. DMC and PX from the bottom of EDC are fed to 23th stages of the ERC. DMC is obtained as the distillate product while the high purity entrainer is obtained in the bottom stream and then is recycled to the EDC with a small quantity of PX.



Flowsheet of Extractive Distillation of Dimethyl Carbonate-Ethanol Solution

The property table for the flowsheet is given below:

Object	Feed	Recycle	Ethanol	Bottom Mixed	Dimethyl Carbonate	p-Xylene	Units
Temp	300	137.926	78.6637	120.892	89.9577	137.926	C
Pressure	1.01325	1.01325	1.01325	1.01325	1.01325	1.01325	Bar
Molar Flow	13.707	55.6142	13.707	69.685	14.0708	55.6142	mol/s
Molar Fraction (Mixture)/ Ethanol	0.999	3.69E-11	0.999	0.00280	0.0139039	3.69E-11	
Molar Fraction (Mixture)/ Dimethyl Carbonate	0.001	0.0001	0.001	0.199193	0.986096	0.0001	

Table-1 Streamwise Result for Extractive Distillation of Acetic acid-Benzene Solution

➤ REFERENCES:

Energy-efficient extractive pressure-swing distillation for separating binary minimum azeotropic mixture dimethyl carbonate and ethanol.

By - Ao Yanga, Shirui Suna, Tao Shia, Di Xuc, Jingzheng Rend, Weifeng Shena