

Production of Methyl acetate by carbonylation of Dimethyl ether

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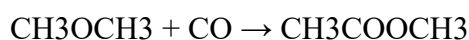
Property package used: UNIFAC

Background:

Methyl acetate is an organic compound with molecular formula $C_3H_6O_2$. It is a clear, colourless liquid with fruity odour, typical of esters. It is highly soluble in common organic solvents, but only slightly soluble in water. It has a boiling point of 57.1°C and a molecular weight of 74.08 g/mol . Methyl acetate is used as a volatile low toxicity solvent in paints, glues, and nail polish removers.

Process description:

The reaction is given as:



It is a mixed phase reaction. Reaction rate is given by; $k=19892e^{-E/RT}$

where, $E=100000\text{ J/mol/K}$

Carbon monoxide feed, containing 2%(mol) Hydrogen gas impurities, at 5 atm is compressed to 32 atm and mixed with recycle stream and vapor stream of dimethyl ether, formed by pumping liquid dimethyl ether to 32 atm and heating it in a heater operating at 372K. This mixed feed is charged to plug flow reactor, operated at 475K. The product mixture is cooled and fed to a gas-liquid separator, working at 320K and 30 atm, which separates Hydrogen and CO as vapour, and rest as liquid. The liquid is fed to distillation column, operating at a reflux ratio 1.3 times the minimum and a uniform pressure of 5 atm. Total condenser is used. Dimethyl ether is the light key component, with a mole fraction of 0.01 in bottoms and methyl acetate is the heavy key component, with a mole fraction of 0.01 in distillate.

Results and Conclusion:

Methyl acetate is produced at a rate of 247.6144 kmol/hr and a purity of 99.99 mol%, which is quite satisfactory. In practice, impurity is the small amount of methanol which comes along with the DME feed.

Reference:

-DWSIM Flowsheeting Project

-Production of methyl acetate using carbonylation of Dimethyl ether

Anil Miriyam