

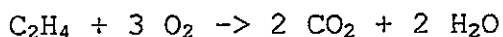
Process and apparatus for preparing vinyl acetate monomer

5 The invention relates to a process and an apparatus for preparing vinyl acetate monomer in a heterogeneously catalysed, continuous gas phase process by reacting ethylene with acetic acid and oxygen in a tube bundle reactor.

10 Vinyl acetate monomer (VAM) is prepared in a continuous process with recycling of the purified product stream (cycle gas system). In a heterogeneously catalysed gas phase process, ethylene reacts with acetic acid and oxygen over fixed bed catalysts which generally
15 comprise palladium and alkali metal salts on a support material and may additionally be doped with gold, rhodium or cadmium.

The ethylene, oxygen and acetic acid reactants are
20 reacted in an exothermic reaction (VAM: $\Delta_B H^\circ_{299} = -176$ kJ/mol), generally at a pressure of 1 to 30 bar and a temperature of 130°C to 200°C, in a fixed bed tubular reactor to give vinyl acetate monomer:
$$C_2H_4 + CH_3COOH + \frac{1}{2} O_2 \rightarrow CH_3COOCH=CH_2 + H_2O$$

25 The main side reaction is the total oxidation of ethylene to CO_2 :



The heat of formation here is $\Delta_B H^\circ_{299} = -1324$ kJ/mol!

30 The ethylene conversion is about 10%, the acetic acid conversion 20 to 30%, and the oxygen conversion up to 90%.

In the preparation of vinyl acetate monomer, a gas
35 mixture consisting predominantly of ethylene, carbon dioxide, ethane, nitrogen and oxygen is circulated. Upstream of the fixed bed tubular reactor, the gas stream is admixed with the acetic acid, ethylene and oxygen reactants, and brought to reaction temperature

METHOD AND DEVICE FOR PRODUCING VINYL ACETATE

5 The invention relates to a process and an apparatus for preparing vinyl acetate monomer in a heterogeneously catalysed, continuous gas phase process by reacting ethylene with acetic acid and oxygen in a tube bundle reactor.

10 Vinyl acetate monomer (VAM) is prepared in a continuous process with recycling of the purified product stream (cycle gas system). In a heterogeneously catalysed gas phase process, ethylene reacts with acetic acid and oxygen over fixed bed catalysts which generally
15 comprise palladium and alkali metal salts on a support material and may additionally be doped with gold, rhodium or cadmium.

The ethylene, oxygen and acetic acid reactants are
20 reacted in an exothermic reaction (VAM: $\Delta_B H^\circ_{299} = -176 \text{ kJ/mol}$), generally at a pressure of 1 to 30 bar and a temperature of 130°C to 200°C, in a fixed bed tubular reactor to give vinyl acetate monomer:
$$\text{C}_2\text{H}_4 + \text{CH}_3\text{COOH} + \frac{1}{2} \text{O}_2 \rightarrow \text{CH}_3\text{COOCH}=\text{CH}_2 + \text{H}_2\text{O}$$

25 The main side reaction is the total oxidation of ethylene to CO_2 :



The heat of formation here is $\Delta_B H^\circ_{299} = -1324 \text{ kJ/mol}$!

30 The ethylene conversion is about 10%, the acetic acid conversion 20 to 30%, and the oxygen conversion up to 90%.

In the preparation of vinyl acetate monomer, a gas
35 mixture consisting predominantly of ethylene, carbon dioxide, ethane, nitrogen and oxygen is circulated. Upstream of the fixed bed tubular reactor, the gas stream is admixed with the acetic acid, ethylene and oxygen reactants, and brought to reaction temperature