

Claims

1. Process for the manufacture of methacrylic acid, wherein in a first reactor a gaseous mixture of isobutene, an oxygen containing gas, and water, are reacted obtaining a methacrolein containing process gas I which is further oxidized, with additional oxygen containing gas and water in a second reactor, where a process gas IV is obtained containing methacrylic acid and unconverted methacrolein characterized in that
 - a. process gas I with a temperature of 300°C to 450°C is mixed with process gas V resulting from an evaporation section of crude methacrolein, whereby unconverted methacrolein, an oxygen containing gas and water are mixed, resulting in a process gas II,
 - b. this process gas II with a resulting temperature between 200°C and 300°C is mixed with a stream VI, containing another part of unconverted methacrolein, resulting in a process gas III, and
 - c. process gas III is further oxidized in a second reactor, resulting in process gas IV.
2. Process according to claim 1 characterized in that process gas I, exiting the first reactor with a temperature between 320°C and 400°C, contains less than 2000 ppm by volume Isobutene and between 2 and 6 vol% methacrolein.
3. Process according to claim 1 and 2 characterized in that process gas V is exiting the methacrolein evaporator section at a temperature between 30°C and 200°C, and has a total fuel content of less than 2 vol%, and in that the process gas V is further heated optionally by indirectly contact with process gas I before process gas I is directly mixed with process gas V.
4. Process according to claim 1 and/or claim 3 characterized in that
 - a. Process gas IV is condensed and processed, whereby the processing comprises at least one quenching column, one crystallization step, one absorption and desorption step in a manner to obtain a separation of crude methacrylic acid and crude methacrolein from inert gas
 - b. This crude methacrolein stream is partially introduced and mixed into process gas II at a temperature below 100°C to give a resulting process gas III
5. Process according to claim 1 to 4 characterized in that the crude methacrolein of process gas V is partially reintroduced into the process as a gaseous mixture by mixing with process gas I after mixing with additional air, inert gas and water, and the other part of the recycling methacrolein in stream VI is reintroduced into the process in liquid form by a spray device,

- 5 6. Process according to any of the prior claims characterized in that that the process gas I contains less than 7 wt%, preferred between 0.1 and 5 wt%, of C1-C5 saturated and unsaturated hydrocarbon compounds unlike methacrolein and at least 65 wt%, preferred between 75 and 99.9 wt% methacrolein.
- 10 7. Process according to claim 3 and claim 4 characterized in that a crude methacrolein stream is partially conveyed in liquid form and inserted into process gas II by a spray device and additional gaseous stream containing nitrogen is used and mixed into process II,
8. Process according to any of the prior claims characterized in that the recycled liquid methacrolein and/or the crude methacrolein is stored and conveyed at a temperature below 60°C in the presence of a stabilizer.
- 15 9. Process according to any of the prior claims characterized in that process gas III has a temperature between 150°C and 300°C after mixing process gas II and stream VI.