CLAIMS:

1. A process for purifying a crude methyl methacrylate (MMA) stream comprising MMA at a level of at least 80 wt% and ethyl acrylate (EA), comprising the steps of:-

(i) fractionally crystallising the said MMA stream to provide a fractionally crystallised MMA stream having a reduced EA content relative to the MMA stream immediately prior to fractional crystallisation.

2. The process according to claim 1, wherein one, two or more fractional crystallisations of the crude MMA stream are carried out in series to progressively remove the EA from the crude stream.

3. The process according to claim 1 or 2, wherein the crude stream is subject to a pre-fractional crystallisation purification step by a technique other than fractional crystallisation to produce a pre-fractional crystallisation purified crude stream having a MMA level of at least 92.5 wt%.

4. The process according to claim 3, wherein the crude MMA stream also comprises impurities other than EA and the process comprises the step of : -

a pre- fractional crystallisation purification by a technique other than fractional crystallisation of the crude MMA stream comprising the impurities other than EA and EA to obtain a pre-fractional crystallisation purified crude MMA stream comprising reduced content of the said impurities other than EA relative to the unpurified crude MMA stream and at least 92.5 wt% MMA prior to fractionally crystallising the said crude MMA stream in step (i).

5. The process according to any preceding claim, wherein the fractionally crystallised MMA stream contains impurities other than EA and the said stream is subjected to a post-fractional crystallisation purification step by a technique other than fractional crystallisation to provide reduced content of the said impurities other than EA relative to the fractionally crystallised stream content prior to said step.

6. The process according to any preceding claim, wherein the crude MMA stream comprises between 80-99 wt% MMA, typically between 90-99 wt% MMA.

7. The process according to any preceding claim, wherein EA is present in the crude stream at a level of <10 wt%, typically, <7.5 wt%, more typically, <5 wt%, most typically, <2 wt%, especially, < 1.5 wt%.

8. The process according to any preceding claim, wherein the EA is present in the crude stream at a level of from 0.01 to 10 wt%, typically, 0.01 to 7.5 wt%, more typically, 0.05 to 5 wt%, most typically, 0.1 to 1.5 wt%.

9. The process according to any preceding claim, wherein the crude MMA stream immediately prior to fractional crystallisation comprises at least 92.5 wt%, typically, at least 97.5 wt%, more typically, at least 99 wt% MMA.

10. The process according to any preceding claim, wherein the process produces a fractionally crystallised MMA stream with an MMA content of >98 wt%.

11. The process according to any preceding claim, wherein the fractionally crystallised MMA stream comprises at least 99 wt%, typically, at least 99.5 wt%, more typically, at least 99.8 wt%, most typically, at least 99.9 wt% MMA.

12. The process according to any of claims 1 to 11, wherein the ratio of EA in the fractionally crystallised MMA stream compared to the crude MMA stream is <1:2, typically, <1:10, more typically, <1:50.

13. The process according to any of claims 1 to 12, wherein the crude MMA stream is obtained from depolymerised (co)polymer(s) comprising MMA residues, typically, >80% MMA residues, such as >85, >90 or >95% MMA residues.

14. The process according to any of claim 13, wherein the crude MMA stream is obtained from depolymerised (co)polymer(s) comprising copolymers with MMA and EA residues, typically, >1% EA residues, such as >2, 3, 4, or 5% EA residues such as 1 to 20%, 1 to 15% or 1 to 10% EA residues.

15. The process according to any preceding claim, wherein the fractionally crystallised MMA stream comprises <5000 ppm EA, typically, <1000 ppm EA, more typically <500 ppm EA, most typically, <100 ppm EA.

16. The process according to any preceding claim, wherein the fractionally crystallised MMA stream comprises <350 ppm MiB, typically <200 ppm MiB. more typically, < 100ppm MiB

17. The process according to any preceding claim, wherein the fractionally crystallised MMA stream comprises <500 ppm MA, typically <200ppm MA, more typically, <100ppm MA, most typically, <25 ppm MA.

18. The process according to any preceding claim, wherein the fractional crystallisation process of step (i) is selected from suspension crystallisation or layer crystallisation such as static crystallisation or falling film crystallisation.

19. The process according to any preceding claim, wherein one or more further fractional crystallisation step(s) is carried out on the product stream from step (i) and when carried out the levels and ratios of impurity and MMA following fractional crystallisation above may apply to the product stream of the said one or more further fractional crystallisations.

20. The process according to any preceding claim, wherein the fractional crystallisation includes a first stage comprising a first cooling phase of the crude stream to produce crystals and a residue, an optional sweating phase to heat and partially remelt the crystals formed in the first cooling phase and produce sweated crystals and a sweating phase liquor, and a crystal melting phase to produce a purified liquid therefrom.

21. The process according to claim 20, wherein at least one further crystallisation stage is performed that recrystallises the purified liquid stream produced from the first stage in accordance with the protocol of the first stage.

22. The process of claim 21, wherein two or more further such crystallisations are performed sequentially.

23. The process according to any of claims 20 to 22, wherein after the first cooling phase the residual liquor may be removed or recycled for further crystallisations.

24. The process according to any of claims 20 to 23, wherein the liquor of the sweating phase may be recycled for further crystallisations.

25. The process according to any of claims 20 to 24, wherein the cooling phase includes an initial nucleation phase, where the temperature of the stream to be purified is temporarily lowered to initiate crystal formation, and a crystal formation phase where the temperature is initially raised and optionally slowly lowered again for slower crystal formation during the rest of the cooling phase.

26. The process according to any preceding claim, wherein the fractional crystallisation includes a nucleation phase, typically, wherein the temperature of the stream to be purified is temporarily lowered to initiate crystal formation.

27. The process according to any preceding claim, wherein the fractional crystallisation includes a crystal growth phase, typically, wherein the temperature that effected nucleation is initially raised and optionally slowly lowered again for slower crystal formation.

28. The process according to any preceding claim, wherein the crystals formed during the fractional crystallisation are subjected to one or more sweating phases to heat and partially remelt the crystals formed.

29. The process according to any of claims 20 to 28, wherein the temperature range for crystal formation in the cooling phase of the crude MMA is -48 to -70°C, more typically, -50 to -69°C, most typically, -52 to -69°C.

30. The process according to any of claims 25 to 29, wherein the temperature for the nucleation phase is in the range -53 to -75°C, more typically, -55 to -72°C, most typically, -58 to -62°C.

31. The process according to any of claims 25 to 30, wherein the protocol for the fractional crystallisation comprises a nucleation phase cooling step, applied to the stream to be fractionally crystallised, in the range -53 to -75°C until crystals begin to form.

32. The process according to any of claims 25 to 31, wherein the protocol for the fractional crystallisation comprises a heating step, applied to the stream to be fractionally crystallised, to the crystal formation phase initial temperature.

33. The process according to claim 32, wherein the initial temperature is above the nucleation temperature and less than or equal to -48°C.

34. The process according to any of claims 25 to 33, wherein the protocol for the crystallisation comprises an incremental cooling down of the stream from the initial temperature during the crystal formation phase and for the crystal formation period.

35. The process according to claims 34, wherein the crystal formation period is 1 to 20 hours.

36. The process according to any preceding claim, wherein the fractional crystallisation operating temperatures for crystal formation are between -45°C and -70°C.

37. The process according to any preceding claim, wherein the fractional crystallisation operating pressure is between 0.1 and 5 bara, such as 0.5 to 2 bara or 0.8 to 1.5 bara.

38. The process according to any of claims 3 to 37, wherein the pre- and post-fractional crystallisation purification steps are independently selected from specialised distillation techniques such as fractional distillation, reactive distillation, dividing wall distillation and spinning band distillation, reactive crystallisation, evaporative crystallisation, cooling crystallisation, evaporation, vapor compression evaporation, membrane filtration, reverse osmosis, ultrafiltration, gas-liquid chromatography, high pressure liquid chromatography (HPLC), gel permeation chromatography, ion exchange chromatography, adsorption, sublimation and liquid-liquid extraction.

39. The process according to any of claims 3 to 38, wherein one or more purification steps other than fractional crystallisation are carried out on the crude stream prior to fractional crystallisation of the crude stream.

40. The process according to any of claims 5 to 39, wherein one or more purification steps other than fractional crystallisation are carried out on the fractionally crystallised product stream.

41. An MMA stream produced by a process according to any preceding claim, wherein the MMA stream has a purity of at least 99 wt%, and comprises EA at <5000 ppm, typically, <1000 ppm EA, more typically <500 ppm EA, most typically, <100 ppm EA.

42. MMA produced by a process according to any of claims 1 to 40, wherein the MMA stream has a purity of at least 99 wt%, and comprises EA at <5000 ppm, typically, <1000 ppm EA, more typically <500 ppm EA, most typically, <100 ppm EA.

43. MMA having a purity of at least 99 wt%, and comprising EA at <5000 ppm, typically, <1000 ppm EA, more typically <500 ppm EA, most typically, <100 ppm EA.