Summary of the invention

In the first aspect, there is provided ~~The present invention therefore relates to~~ a process for recoveringy ~~of~~ noble products starting from heavy (meth)acrylic fractions generated during the production of (meth)acrylic esters by transesterification, the heavy fractions comprising at least the noble products and Michael adducts resulting from reactions of addition on the (meth)acrylic double bonds, said process comprising the steps of:

(i) adding at least one antifouling agent and optionally a viscosity-reducing compound to the heavy fractions;

(ii) submitting the mixture to a sufficient temperature and to distillation conditions for cracking the Michael adducts into their constituent components;

(iii) recovering the noble products in the form of a stream of distillate, and of a final residue that is sufficiently fluid to be transported by means of a pump.

"Noble products" are products whose recycling is useful for optimizing the economic balance of an industrial process.

The expression "heavy fraction" used in the definition of the ~~invention~~disclosure is a stream, generally a residue obtained at the bottom of a distillation column, comprising heavy byproducts whose boiling point is above the boiling points of the products employed in the reaction and of the desired product. They are notably Michael adducts, formed as explained above, as well as oligomers or polymers that have formed. The heavy fraction also generally comprises the transesterification catalyst as well as the polymerization inhibitors added to the reaction, as well as a minor fraction of noble products and traces of light compounds.

In this particular case, the heavy fraction submitted to the process according to the ~~invention~~disclosure

comprises, as noble products, the unreacted reactants, i.e. the light alkyl (meth)acrylate (EA or MA) and the alcohol, as well as the (meth)acrylic ester produced, recycling of which makes it possible to increase the productivity of the (meth)acrylic ester manufacturing process.

The process of the ~~invention~~disclosure is particularly suitable for optimizing the productivity and the economic balance of a process for manufacturing dialkylaminoalkyl (meth)acrylates by transesterification of a light alkyl (meth)acrylate with an amino alcohol, preferably of a process for manufacturing N,N-dimethylaminoethyl acrylate (ADAME) by transesterification reaction between a light alkyl acrylate and N,N-dimethylaminoethanol (DMAE).

The process according to the ~~invention~~disclosure can be carried out in batch (discontinuous) mode or continuously.

The heavy fraction submitted to the process according to the ~~invention~~disclosure then comprises, as noble products, at least one dialkylaminoalkyl (meth)acrylate and an amino alcohol, preferably at least N,N-dimethylaminoethyl acrylate and N,N-dimethylaminoethanol (DMAE).

In a~~A~~ second ~~object of the invention therefore consists of~~ aspect, there is provided a process for manufacturing a dialkylaminoalkyl (meth)acrylate of formula (I):

$$H_2C = C(R'i) - C(O) - O - A - N(R'_2)(R'_3) \qquad (I)$$

in which:

- R'i is a hydrogen atom or a methyl radical
- A is a linear or branched C_1-C_5 alkylene radical
- R'_2 and R'_3, which may be identical or different, each represent a C_1-C_4 alkyl radical,

by transesterification reaction between an amino alcohol of formula (II):

optionally a viscosity-reducing compound; (ii) submitting the mixture to a sufficient temperature and to distillation conditions for cracking the Michael adducts into their constituent components; (iii) recovering the noble products in the form of a stream of distillate, and of a final residue that is sufficiently fluid to be transported by means of a pump;

e) recycling, to the purification step c), at least a proportion of said stream of distillate comprising at least one compound selected from the (meth)acrylic ester (I), the amino alcohol (II) or the alkyl (meth)acrylate (III);

f) disposal of the final residue for example by incineration.

According to one embodiment of the ~~invention~~disclosure, the purification step c) is carried out using two distillation columns in series, and at least a proportion of the stream of distillate from step d) is recycled to the top of the first purification column.

The ~~invention~~disclosure is advantageously implemented for producing N,N-dimethylaminoethyl acrylate (ADAME) by transesterification reaction between methyl acrylate (MA) or ethyl acrylate (EA) and N,N-dimethylaminoethanol (DMAE).

A more detailed, nonlimiting description of the ~~invention~~disclosure is now presented below, referring to the accompanying Fig. 1, which shows schematically a preferred embodiment of an installation according to the ~~invention~~disclosure for a continuous process for producing ADAME by transesterification starting from EA and DMAE.