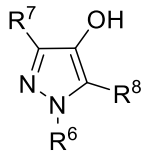
Claims

1. A mixture comprising one or more compounds of the general formula (II)



(II)

where

R^6 is H, or C_1 to C_{20} alkyl, where C_1 to C_{20} alkyl comprises straight-chain or branched C_1 to C_{20} alkyl groups or cyclic C_3 to C_{20} alkyl groups,

R^7 is H, C_1 to C_{20} alkyl, where C_1 to C_{20} alkyl comprises straight-chain or branched C_1 to C_{20} alkyl groups or cyclic C_3 to C_{20} alkyl groups, or alkanoyl having C_1 to C_8 alkyl, where C_1 to C_8 alkyl comprises straight-chain or branched C_1 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, ~~cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl,~~ and

~~R^7 is H, C_4 to C_{20} alkyl, where C_4 to C_{20} alkyl comprises straight-chain or branched C_4 to C_{20} alkyl groups or cyclic C_3 to C_{20} alkyl groups, phenyl, carboxylic esters having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, alkanoyl having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl, and~~

~~R^8 is H, C_4 to C_{20} alkyl, where C_4 to C_{20} alkyl comprises straight-chain or branched C_4 to C_{20} alkyl groups or cyclic C_3 to C_{20} alkyl groups, phenyl, carboxylic esters having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, alkanoyl having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl,~~
R^8 is H, or C_1 to C_{20} alkyl, where C_1 to C_{20} alkyl comprises straight-chain or branched C_1 to C_{20} alkyl groups or cyclic C_3 to C_{20} alkyl groups,

and (meth)acrylic acid and/or C_1 to C_8 alkyl (meth)acrylates.

2. The mixture according to claim 1, wherein

~~R^6 is H, C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, alkanoyl having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl,~~

~~R^7 is H, C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, phenyl, carboxylic esters having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, alkanoyl having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl~~

~~groups or cyclic C_3 to C_8 alkyl groups, cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl, and~~

~~R^8 is H, C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, phenyl, carboxylic esters having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, alkanoyl having C_4 to C_8 alkyl, where C_4 to C_8 alkyl comprises straight-chain or branched C_4 to C_8 alkyl groups or cyclic C_3 to C_8 alkyl groups, cyanophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 3,4-dichlorophenyl, 2-bromophenyl, 3-bromophenyl, 4-bromophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, dimethylphenyl, such as 3,4-dimethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-ethylphenyl, 3-ethylphenyl, 4-ethylphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 4-isopropylphenyl, benzyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, (carboxymethyl)phenyl, in which the carboxyl group may also be esterified with C_4 to C_6 alkyl, where C_4 to C_6 alkyl comprises straight-chain or branched C_4 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, (N,N-dimethylsulfonamido)phenyl, sulfonamidophenyl or 4-isopropoxyphenyl.~~
R^6 is H, or C_1 to C_6 alkyl, where C_1 to C_6 alkyl comprises straight-chain or branched C_1 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups,

R^7 is H, C_1 to C_6 alkyl, where C_1 to C_6 alkyl comprises straight-chain or branched C_1 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, or alkanoyl having C_1 to C_6 alkyl, where C_1 to C_6 alkyl comprises straight-chain or branched C_1 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups, and

R^8 is H, or C_1 to C_6 alkyl, where C_1 to C_6 alkyl comprises straight-chain or branched C_1 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups.

3. The mixture according to claim 1, wherein

R^6 is ~~H or~~ C_1 to ~~C_6~~C_{20} alkyl, where C_1 to ~~C_6~~C_{20} alkyl comprises straight-chain or branched C_1 to ~~C_6~~C_{20} alkyl groups or cyclic C_3 to ~~C_6~~C_{20} alkyl groups,

R^7 is H, or C_1 to ~~C_6~~C_{20} alkyl, where C_1 to ~~C_6~~C_{20} alkyl comprises straight-chain or branched C_1 to ~~C_6~~C_{20} alkyl groups, and

R^8 is H, or ~~cyclic C_3 to C_6 alkyl groups, or alkanoyl having~~ C_1 to ~~C_6~~C_{20} alkyl, where C_1 to ~~C_6~~C_{20} alkyl comprises straight-chain or branched C_1 to ~~C_6~~C_{20} alkyl groups ~~or cyclic C_3 to C_6 alkyl groups, and~~.

~~R^8 is H or C_1 to C_6 alkyl, where C1 to C_6 alkyl comprises straight-chain or branched C_1 to C_6 alkyl groups or cyclic C_3 to C_6 alkyl groups.~~

4. The mixture according to any of claims 1 to 3, wherein C_1 to C_8 alkyl (meth)acrylates are methyl (meth)acrylate, ethyl (meth)acrylate, n-butyl (meth)acrylate, 2-ethylhexyl (meth)acrylate or a mixture of two or more of said (meth)acrylic esters.

5. The mixture according to any of claims 1 to 4, wherein the total amount of compounds of the general formula (II) in the mixture is 0.1 to 1000 ppm by weight based on the total weight of the amount of (meth)acrylic acid and C_1 to C_8 alkyl (meth)acrylates present in the mixture.

6. The mixture according to any of claims 1 to 5, wherein the total amount of (meth)acrylic acid and C_1 to C_8 alkyl (meth)acrylates in the mixture is at least 5% by weight based on the total weight of the mixture.

7. The mixture according to any of claims 1 to 3 or 5 to 6, wherein the mixture comprises (meth)acrylic acid and wherein the mixture comprises one or more of the following components:

   a. water 20 to 15 000 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
   b. di(meth)acrylic acid 100 to 20 000 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
   c. acetic acid 100 to 2000 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
   d. propionic acid 100 to 2000 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
   e. one or more aldehydes, such as acetaldehyde, acrolein, propionaldehyde, 2-furfural, 3-furfural, coumarone or benzaldehyde, the amount of each aldehyde being 0 to 1 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
   f. protoanemonin 0 to 2 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,

g. maleic acid 0 to 1 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
h. maleic anhydride 0 to 1 ppm by weight based on the total weight of (meth)acrylic acid present in the mixture,
i. allyl acrylate 0 to 30 ppm by weight, preferably 0 to 1 ppm by weight, based on the total weight of (meth)acrylic acid present in the mixture.

8. The mixture according to any of claims 4 to 6, wherein the mixture comprises one or more (meth)acrylic esters according to claim 4 and wherein the mixture comprises one or more of the following components:

a. water 1 to 2000 ppm by weight, preferably 1 to 500 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture,
b. (meth)acrylic acid 1 to 2000 ppm by weight, preferably 1 to 100 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture,
c. alcohols of the respective (meth)acrylic esters 0.01 to 2000 ppm by weight, preferably 0.1 to 1000 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture,
d. propionic esters with the alcohols of the respective (meth)acrylic esters 0.1 to 2000 ppm by weight, preferably 10 to 1000 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture,
e. acetic esters with the alcohols of the respective (meth)acrylic esters 1 to 2000 ppm by weight, preferably 5 to 2000 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture,
f. ethers of the respective (meth)acrylic ester alcohols 0 to 2000 ppm by weight, in each case based on the total weight of (meth)acrylic esters according to claim 4 present in the mixture.

9. The mixture according to any of claims 1 to 8, wherein the mixture is stored and/or transported under an oxygen-containing atmosphere.

10. The mixture according to any of claims 1 to 9, wherein the mixture comprises a co-stabilizer.

11. The use of one or more compounds of the general formula (II) as defined in any of claims 1 to 3 for the storage- and/or transport-stabilization of (meth)acrylic acid and/or C_1 to C_8 alkyl (meth)acrylates.

12. A method for polymerizing (meth)acrylic acid and/or C_1 to C_8 alkyl (meth)acrylates in the presence of one or more compounds of the general formula (II) as defined in any of claims 1 to 3, the reaction mixture being 0 to 50% saturated with oxygen, the degree of oxygen saturation referring to the degree of oxygen saturation that is achieved at equilibrium when the mixture is stored and/or transported under standard conditions under an oxygen-containing atmosphere having an oxygen content of 5 to 30 vol%.

13. A method for stabilizing (meth)acrylic acid and/or C_1 to C_8 alkyl (meth)acrylates through the use of one or more compounds of the general formula (II) as defined in any of claims 1 to 3.