CLAIMS:

1. A compound of the formula (I)

$$ALK\text{-}SO_2\text{-}O\text{-}O\text{-}SO_2OX,$$

wherein ALK is a branched or unbranched alkyl group, especially a methyl, ethyl, propyl, butyl, isopropyl, isobutyl group, or a higher alkyl group, and X = hydrogen, zinc, aluminium, an alkali or alkaline earth metal.

2. A mixture containing the compound according to claim 1 and at least one compound selected from the group consisting of formula (II) to (XI) and combinations thereof.

3. The compound of claim 1 or the mixture of claim 2 in sulfuric acid or alkylsulfonic acid, especially methanesulfonic acid or combinations therof.

4. A process for manufacturing the compound according to claim 1 with X = H, comprising the following steps:

- reacting alkanesulfonic acids, especially methanesulfonic acid, with hydrogen peroxide;
- then adding oleum;
- followed by the isolation of the compound.

5. A process for manufacturing the compound according to claim 1 with X = H, zinc, aluminium, alkali or alkaline earth metal, comprising the following steps:

reacting a mono-alkali peroxosulfate or zinc peroxosulfate or aluminium peroxosulfate or alkaline earth peroxosulfate with alkanesulfonic acid halide, especially methanesulfonic acid halide, and separating the compound according to claim 1 from the alkali or alkaline earth halide formed

or

reacting an alkali mono-alkylperoxosulfonate, especially sodium methylperoxosulfonate, or zinc mono-alkylperoxosulfonate or aluminium mono-alkylperoxosulfonate or alkaline earth mono-alkylperoxosulfonate with chloro- or bromosulfonic acid, and separating the compound according to claim 1 from the alkali or alkaline earth halide formed.

6. The process according to claim 4 or 5, wherein said separating is effected by means of precipitation or chromatography.

7. Use of the compound according to claim 1 or of the mixture according to claim 2 or 3 as an initiator for preparing alkanesulfonic acids, especially methanesulfonic acid, from alkane, especially methane, and oleum.

8. A process for manufacturing alkanesulfonic acids, especially methanesulfonic acid, comprising the following steps:

- providing a solution containing sulfur trioxide/oleum;
- reacting with an alkane, especially methane, in a high-pressure autoclave or laboratory reactor;
- setting a pressure of from 1 to 150 bar;
- preparing the compound of claim 1 or the mixture of claim 2 or 3 as initiator by reacting an alkanesulfonic acid or a solution containing the alkanesulfonic acid with a 30-100% (w/w) hydrogen peroxide solution;
- adding the initiator or a solution thereof to the reactor;
- controlling the temperature of the reaction mixture at 0-100 °C;
- purifying the reaction product, for example, by distillation or extraction.

9. Use of the compound of claim 1 or the mixture of claim 2 or 3 in a device for performing the process according to claim 8, wherein the device is comprising a first reactor (1) in which sulfur trioxide and alkane, especially methane, react with the compound according to claim 1 as initiator, a second reactor (2) in which the compound according to claim 1 is formed, a distillation means (3) for distilling the product formed in the first reactor (1), and a filling means (4), connections from reactor (2) to reactor (1), from reactor (1) to the distillation means (3), and from the distillation means (3) to each of the filling means (4), the second reactor (2), and the first reactor (1).

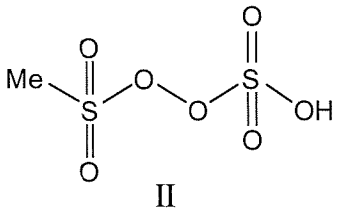
CLAIMS:

1. A compound of the formula (I)

$$ALK\text{-}SO_2\text{-}O\text{-}O\text{-}SO_2OX,$$

wherein ALK is a branched or unbranched alkyl group and X = hydrogen, zinc, aluminium, an alkali or alkaline earth metal.

2. A mixture containing the compound according to claim 1 and at least one compound selected from the group consisting of formula II, III, IV, V, VI, VII, VIII, IX, X, or XI: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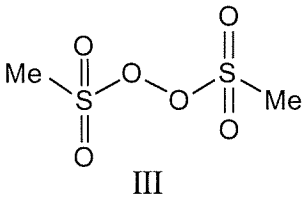
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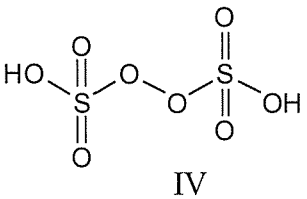
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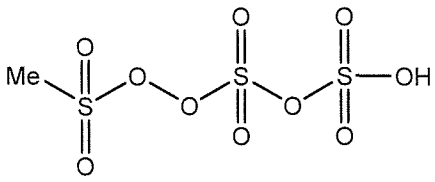
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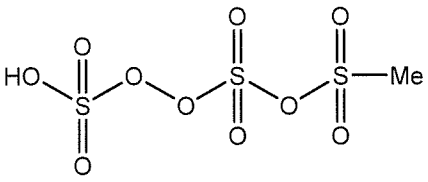
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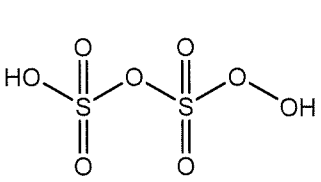
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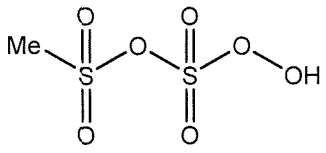
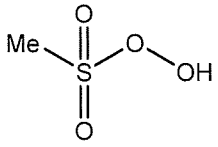
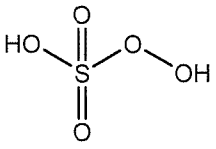

VIII

H_2O_2

IX


X


XI

and combinations thereof.

3. The compound of claim 1 or the mixture of claim 2 in sulfuric acid or alkylsulfonic acid or combinations thereof.

4. A process for manufacturing the compound according to claim 1 with X = H, comprising the following steps:

   - reacting alkanesulfonic acids with hydrogen peroxide;
   - then adding oleum;
   - followed by the isolation of the compound.

5. A process for manufacturing the compound according to claim 1 with X = zinc, aluminium, alkali or alkaline earth metal, comprising the following steps:

   reacting a mono-alkali peroxosulfate or zinc peroxosulfate or aluminium peroxosulfate or alkaline earth peroxosulfate with alkanesulfonic acid halide and separating the compound according to claim 1 from the alkali or alkaline earth halide formed

   or

   reacting an alkali mono-alkylperoxosulfonate or zinc mono-alkylperoxosulfonate or aluminium mono-alkylperoxosulfonate or alkaline earth mono-alkylperoxosulfonate with chloro- or bromosulfonic acid, and separating the compound according to claim 1 from the alkali or alkaline earth halide formed.

6. The process according to claim 4 or 5, wherein said separating is effected by means of precipitation or chromatography.

7. Use of the compound according to claim 1 or of the mixture according to claim 2 or 3 as an initiator for preparing alkanesulfonic acids, especially methanesulfonic acid, from alkane and oleum.

8. A process for manufacturing alkanesulfonic acids comprising the following steps:

   - providing a solution containing sulfur trioxide/oleum;

- reacting with an alkane in a high-pressure autoclave or laboratory reactor;
- setting a pressure of from 1 to 150 bar;
- preparing the compound of claim 1 or the mixture of claim 2 or 3 as initiator by reacting an alkanesulfonic acid or a solution containing the alkanesulfonic acid with a 30-100% (w/w) hydrogen peroxide solution;
- adding the initiator or a solution thereof to the reactor;
- controlling the temperature of the reaction mixture at 0-100 °C;
- purifying the reaction product, for example, by distillation or extraction.

9. Use of the compound of claim 1 or the mixture of claim 2 or 3 in a device for performing the process according to claim 8, wherein the device is comprising a first reactor (1) in which sulfur trioxide and alkane react with the compound according to claim 1 as initiator, a second reactor (2) in which the compound according to claim 1 is formed, a distillation means (3) for distilling the product formed in the first reactor (1), and a filling means (4), connections from reactor (2) to reactor (1), from reactor (1) to the distillation means (3), and from the distillation means (3) to each of the filling means (4), the second reactor (2), and the first reactor (1).

10. The compound according to claim 1, wherein ALK is a methyl, ethyl, propyl, butyl, isopropyl, isobutyl group, or a higher alkyl group.

11. The compound of claim 1 or the mixture of claim 2 in sulfuric acid or methanesulfonic acid or combinations thereof.

12. The process according to claim 4, wherein the alkanesulfonic acid is methanesulfonic acid.

13. The process according to claim 5, wherein the alkanesulfonic acid halide is methanesulfonic acid halide and the alkali mono-alkylperoxosulfonate is sodium methylperoxosulfonate.

14. Use of the compound according to claim 1 or of the mixture according to claim 2 or 3 as an initiator for preparing especially methanesulfonic acid from methane and oleum.

15. A process according to claim 8, wherein the alkanesulfonic acid is methanesulfonic acid and the alkane is methane.

16. Use according to claim 9, wherein the alkane is methane.