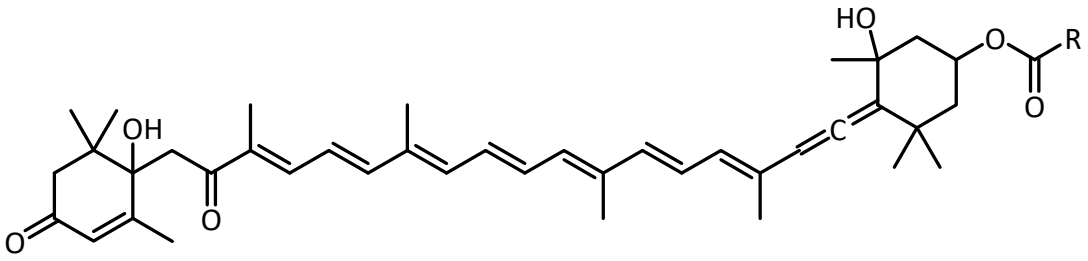
CLAIMS

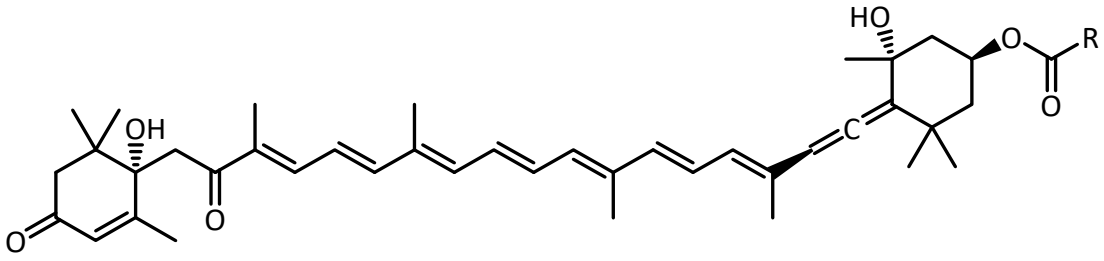
1. A compound of formula (I)



(I)

wherein R is selected from the group consisting of linear or branched C_1-C_4 alkyl, or a stereoisomer thereof.

2. Compound according to claim 1 of formula (Ia)



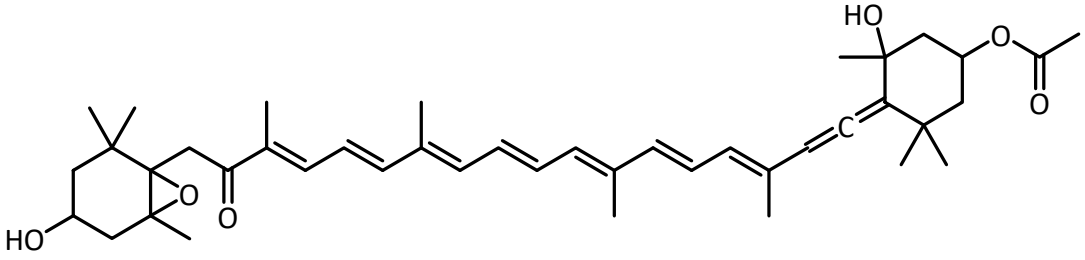
(Ia)

wherein R is as defined in claim 1.

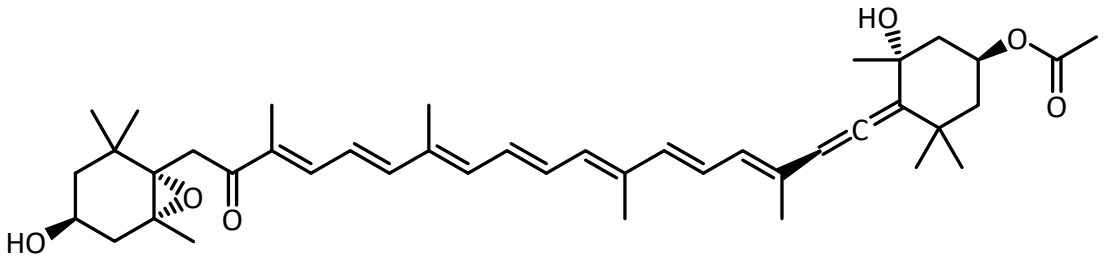
3. Compound according to claim 1 or 2, wherein R is methyl.

4. A process for preparing a compound as defined in any one of claims 1 to 3, which comprises:

a) reacting a compound of formula (II) or (IIa)

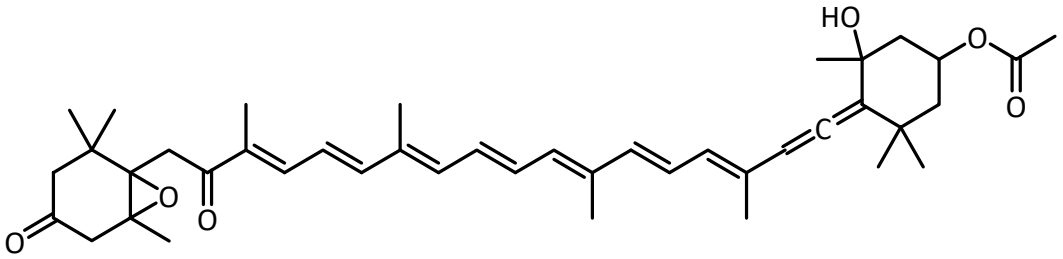


(II)

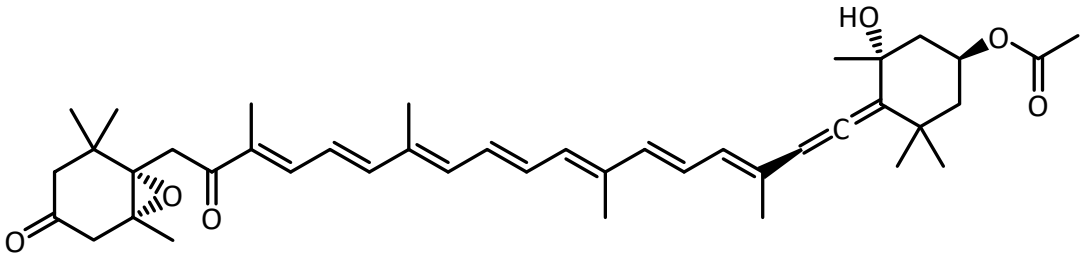


(IIa)

with an oxidant, preferably an oxidant selected from the group consisting of tetra-*n*-propylammonium perruthenate (TPAP) and 2-iodoxybenzoic acid (IBX) and optionally also in the presence of a co-oxidant, preferably *N*-methylmorpholine *N*-oxide (NMO), to give a compound of formula (III) or (IIIa)



(III)

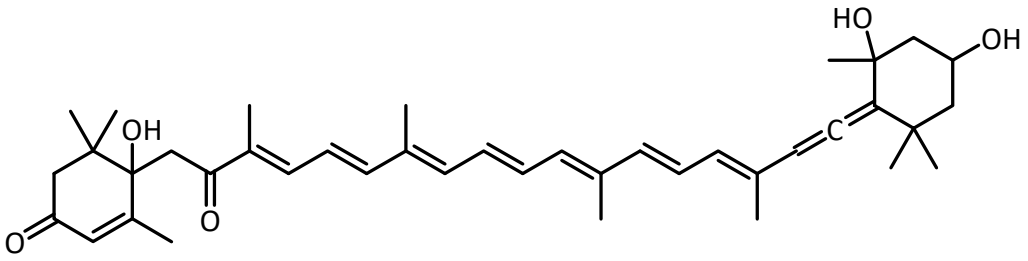


(IIIa)

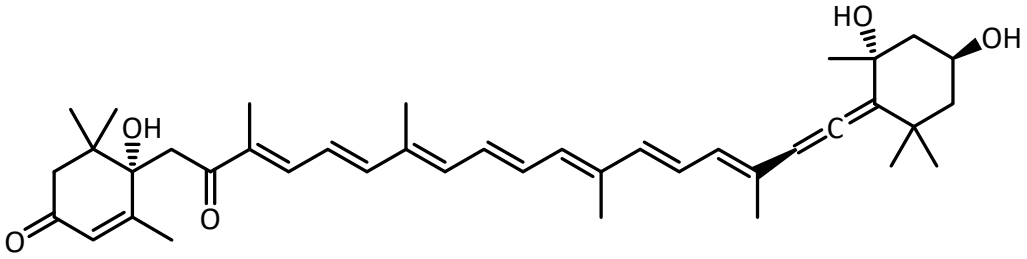
b) treating the compound of formula (III) or (IIIa) with SiO_2 in the presence of a base, preferably a base selected from the group consisting of *N*-methylmorpholine and triethylamine, to give a compound of formula (I) or (Ia) wherein R is methyl, and

c) wherein if the compound of formula (I) or (Ia) R is a linear or branched C_2-C_4 alkyl, the process further comprises:

c1) converting the compound of formula (I) or (Ia) wherein R is methyl to a compound of formula (IV) or (IVa)



(IV)



(IVa)

by treatment with an esterase, preferably a lipase, and

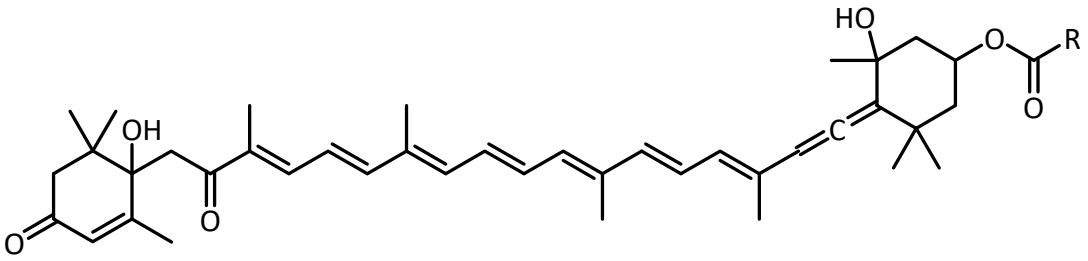
c2) esterification of the compound of formula (IV) or (IVa) with a carboxylic acid of formula (V)

R-COOH

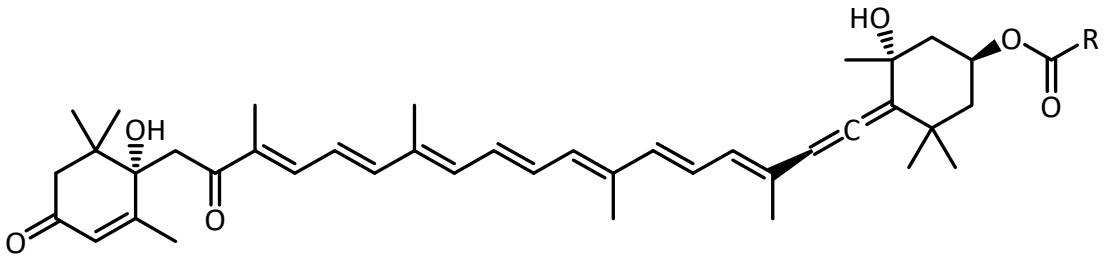
(V)

wherein R is a linear or branched C_2-C_4 alkyl,

in the presence of a coupling agent, preferably a carbodiimide, more preferably a carbodiimide selected from the group consisting of dicyclohexylcarbodiimide (DDC), diisopropylcarbodiimide (DIC) and ethyl-(*N*',*N*'-dimethylamino)propylcarbodiimide (EDC) or a salt thereof, and in the presence of 4-(dimethylamino)pyridine (DMAP), to give a compound of formula (I) or (Ia)



(I)



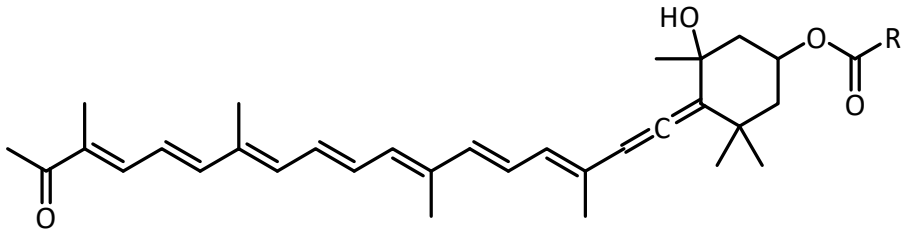
(Ia)

wherein R is selected from the group consisting of linear or branched C_2-C_4 alkyl.

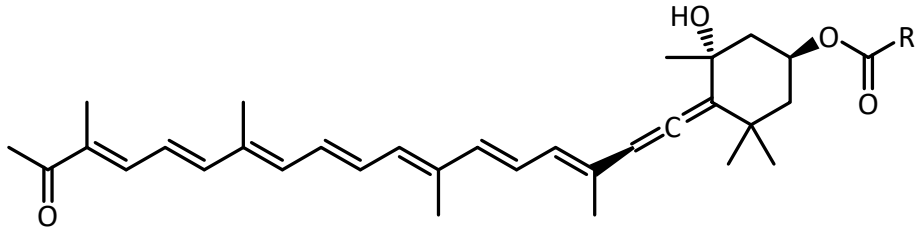
5. The process of claim 4, wherein:

- the oxidant of step a) is TPAP,
- step a) is carried out in the presence of a co-oxidant,
- the co-oxidant in step a) is NMO; and/or
- the base in step b) is N-methylmorpholine.

6. The process of claim 4 or 5 wherein if step a) and/or b) is carried out in the presence of water, then a mixture of a compound as defined in any one of claims 1 to 3 and a compound of formula (VI), preferably of formula (VIa)



(VI)



(VIa)

wherein R is as defined in any one of claims 1 to 3,

is obtained.

7. Use of a compound according to any one of claims 1 to 3 for the preparation of amarouciaxanthin A and/or a composition comprising amarouciaxanthin A and paracentrone.

8. A process for preparing amarouciaxanthin A comprising treating the compound according to any one of claims 1 to 3 with an esterase, preferably a lipase.

9. A composition comprising a compound according to any one of claims 1 to 3 and a compound of formula (VI), preferably of formula (VIa), as defined in claim 6.

10. Pharmaceutical composition comprising a compound according to any one of claims 1 to 3 or a composition according to claim 9.

11. Compound according to any one of claims 1 to 3, a composition according to claim 9 or pharmaceutical composition according to claim 10, for use in medicine.

12. Compound according to any one of claims 1 to 3, a composition according to claim 9 or pharmaceutical composition according to claim 10, for use in the treatment and/or prevention of a disease selected form the group consisting of cancer, a cardiovascular disease, an intestinal flora imbalance, an inflammatory disease, an autoimmune disease, fibrosis, a bacterial infection, a neurological disease, a hyperuricemic-related disease, a senescence-related disorder, a lipid related disease, glucocorticoid induced muscle atrophy, a bone-related disease, an ocular disease, an angiogenic related disease, psoriasis, eczema, atopic dermatitis, and a thyroid-related disorder.

13. The compound, composition or pharmaceutical composition for use according to claim 12 wherein:

- the cancer is as gastric, duodenal, liver, hematologic, breast, glioma, bladder, pancreatic, prostate, colorectal, cervical, nasopharyngeal, lung, kidney, metastasis, melanoma, sarcoma, neural, or skin cancer;

- the cardiovascular disease is hypertension, portal hypertension, pulmonary arterial hypertension, hyperglycemia, type 2 diabetes, insulin resistance, metabolic syndrome or coronary atherosclerosis;
- the inflammatory disease is anaphylactic shock, sepsis or cytokine storm;
- the autoimmune diseases is lupus, sarcoidosis, chronic obstructive pulmonary disease, asthma, primary biliary cholangitis, sclerosing cholangitis, autoimmune hepatitis, inflammatory bowel disease, Crohn's disease, multiple sclerosis and ulcerative colitis;
- the fibrosis is liver fibrosis, renal fibrosis, lung fibrosis, myocardial fibrosis, interstitial fibrosis, IGG4-related fibrosis, sclerodermia or retroperitoneal fibrosis;
- the neurological disease is Parkinson's disease, Alzheimer's disease, dementia, depression or cerebral ischemia;
- the hyperuricemic-related disease is rheumatoid arthritis, gout or kidney stones;
- the lipid related disease is obesity, cholesterol, trigliceridemia, non-alcoholic steatohepatitis or non-alcoholic fatty liver disease;
- the bone related disease is bone loss;
- the ocular disease, is as glaucoma, diabetic retinopathy or age related macular degeneration; and/or
- the angiogenesis related disease is hemorrhagic telangiectasia.

14. A food, a cosmeceutical, a nutraceutical, or a cosmetic composition comprising a compound according to any one of claims 1 to 3 or a composition according to claim 9.

15. A cosmetic method for preventing and/or decreasing cutaneous senescence and/or for ameliorating the cosmetic adverse effects of aging comprising administering the compound according to any one of claims 1 to 3, a composition according to claim 9 or the food, cosmeceutical, nutraceutical or cosmetic composition according to claim 14, to a subject in need thereof.

16. Use of the compound according to any one of claims 1 to 3, the composition according to claim 9 or the pharmaceutical composition according to claim 10 in the manufacture of a medicament for treatment and/or prevention of a disease selected form

the group consisting of cancer, a cardiovascular disease, an intestinal flora imbalance, an inflammatory disease, an autoimmune disease, fibrosis, a bacterial infection, a neurological disease, a hyperuricemic-related disease, a senescence-related disorder, a lipid related disease, glucocorticoid induced muscle atrophy, a bone-related disease, an ocular disease, an angiogenic related disease, psoriasis, eczema, atopic dermatitis, and a thyroid-related disorder.

17. The use according to claim 16 wherein:

- the cancer is as gastric, duodenal, liver, hematologic, breast, glioma, bladder, pancreatic, prostate, colorectal, cervical, nasopharyngeal, lung, kidney, metastasis, melanoma, sarcoma, neural, or skin cancer;
- the cardiovascular disease is hypertension, portal hypertension, pulmonary arterial hypertension, hyperglycemia, type 2 diabetes, insulin resistance, metabolic syndrome or coronary atherosclerosis;
- the inflammatory disease is anaphylactic shock, sepsis or cytokine storm;
- the autoimmune diseases is lupus, sarcoidosis, chronic obstructive pulmonary disease, asthma, primary biliary cholangitis, sclerosing cholangitis, autoimmune hepatitis, inflammatory bowel disease, Crohn’s disease, multiple sclerosis and ulcerative colitis;
- the fibrosis is liver fibrosis, renal fibrosis, lung fibrosis, myocardial fibrosis, interstitial fibrosis, IGG4-related fibrosis, sclerodermia or retroperitoneal fibrosis;
- the neurological disease is Parkinson’s disease, Alzheimer’s disease, dementia, depression or cerebral ischemia;
- the hyperuricemic-related disease is rheumatoid arthritis, gout or kidney stones;
- the lipid related disease is obesity, cholesterol, trigliceridemia, non-alcoholic steatohepatitis or non-alcoholic fatty liver disease;
- the bone related disease is bone loss;
- the ocular disease, is as glaucoma, diabetic retinopathy or age related macular degeneration; and/or
- the angiogenesis related disease is hemorrhagic telangiectasia.