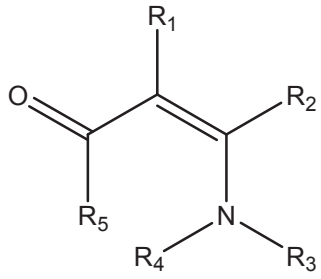
destructive pathways such as fragmentation, and some isomerisations, predominate then the ability of the molecule to continue to absorb UV or visible light is destroyed. While protective compounds are not required to be indefinitely photostable it is important that they provide for a useful lifetime and so resist fast degradation.

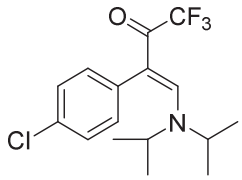
[0006] It would therefore be desirable to provide for compounds which can absorb energy from a variety of ranges within the electromagnetic spectrum or which provide for a variety of molar extinction coefficients or mass extinction coefficients or which can demonstrate improved stability to this exposure to provide for a greater operational lifespan.

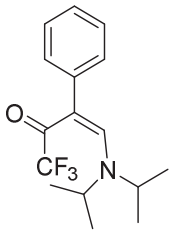
[0007] Further, there is an ongoing need for compounds, whether preferentially photostabilised or not, which provide for improved physical stability. For example, the incorporation of absorbing compounds into lenses and other solid phase polymeric products requires a high level of stability of the compound to the initiating and curing conditions of the polymer.

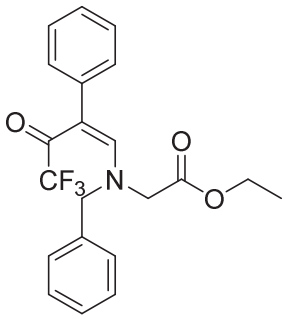
SUMMARY

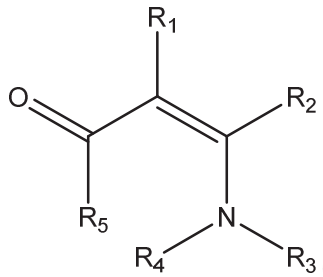
[0008] In one aspect, the present disclosure refers to a compound of formula I, or a salt or cis-trans isomer thereof:  (formula I) wherein, R_1 is selected from the group consisting of phenyl, pyridyl, pyran, thiopyran, diazine, oxazine, thiazine, dioxine, dithiine, pyrrole, furan, thiophene, imidazole, pyrazole, oxazole, isoxazole, thiazole, isothiazole, indole and isoindole, each of which groups may be substituted or unsubstituted; or optionally wherein R_1 is substituted with a moiety selected from halo, C_1 to C_{12} alkyl, C_1 to C_{12} alkoxy, C_2 to C_{12} alkenyl and enamine to form a divalent presentation of a further compound of formula I, each of which groups may themselves be substituted or unsubstituted; R_2 is selected from the group

consisting of hydrogen, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted; or optionally wherein R_2 is phenyl substituted with a moiety selected from the group consisting of C_1 to C_6 alkyl, C_1 to C_6 alkoxy, halo and C_1 to C_6 haloalkyl; R_3 and R_4 are independently selected from the group consisting of unsubstituted or substituted C_1 to C_{20} alkyl, unsubstituted or substituted C_2 to C_{20} alkenyl, unsubstituted or substituted C_2 to C_{20} alkynyl, unsubstituted or substituted C_1 to C_{20} alkylamine, substituted aryl, unsubstituted or substituted heteroaryl, unsubstituted or substituted aroyl, unsubstituted or substituted C_5 to C_7 cycloalkyl, unsubstituted or substituted C_3 to C_8 cycloalkenyl, unsubstituted or substituted C_2 to C_{12} alkanoyloxy, unsubstituted or substituted haloalkyl, and unsubstituted or substituted heterocyclic, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being substituted; or optionally wherein the cyclic structure formed by R_3 and R_4 is substituted with a moiety selected from the group consisting of halo, nitro, cyano, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, C_1 to C_{12} haloalkyl, -N-alkyl, C_1 to C_{12} alkoxy, C_1 to C_{12} alkylalkanoate, C_1 to C_6 haloalkyl, C_5 or C_6 aryl, C_5 or C_6 heteroaryl, C_5 or C_6 heterocyclic and enamine, to form a divalent presentation of a further compound of formula I or formula II, each of which groups may themselves be substituted or unsubstituted; R_5 is selected from the group consisting of C_1 to C_{20} haloalkyl, C_1 to C_{20} haloalkenyl, a fluorine-containing group, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_1 to C_{20} alkoxy, ester, amide, C_1 to C_{20} alkanoyl, C_1 to C_{20} alkenoyl, aryl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted; or optionally wherein R_5 is a substituted C_5 or C_6 aryl and the substituent(s) is selected from the group consisting of C_1 to C_6 alkyl, C_1 to C_6 alkoxy, hydroxyl, nitro, cyano, and halo; wherein, unless otherwise stated, substituted in the above definitions of R_1, R_2, R_3, R_4 and R_5, or a cyclic structure formed by R_3 and R_4 refers to substitution with one or more substituents selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl,

carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl, wherein each of these substituents may themselves be substituted with the same or different substituents selected from this list; and wherein R_3 and R_4 are not ethyl; when one of R_3 or R_4 is alkyl then the other cannot be hydrogen or methyl; and R_3 or R_4 do not form a ring structure or fused ring structure with R_1 and/or R_2; and the compound of formula I is not 

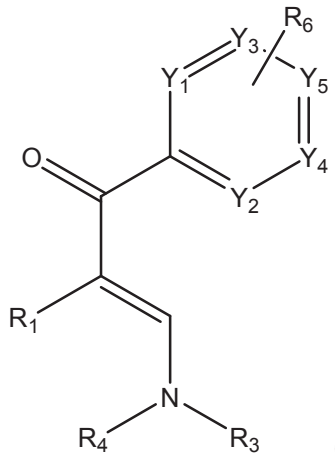
, 

, or 

. In one example, the present disclosure refers to a compound of formula I, or a salt or cis-trans isomer thereof: 

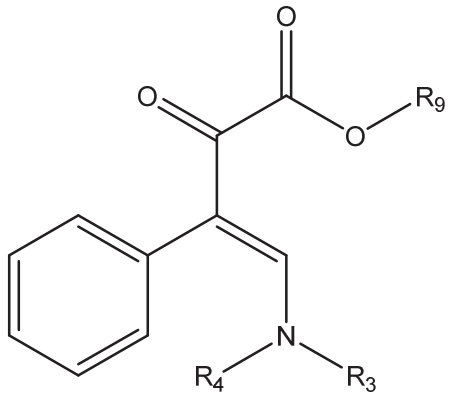
(formula I) wherein, R_1 is selected from the group consisting of C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_2 to C_{20} alkynyl, aryl, aroyl, and C_5 to C_7 cycloalkenyl, each of which groups may be substituted or unsubstituted; R_2 is selected from the group consisting of hydrogen, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted; R_3 and R_4 are independently selected from the group consisting of C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_2 to C_{20} alkynyl, C_1 to C_{20} alkylamine, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkyl, C_3 to C_8 cycloalkenyl, C_2 to C_{12} alkanoyloxy, haloalkyl, and heterocyclic, all of which groups may be substituted or unsubstituted, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being optionally substituted and

when R_3 and R_4 form a 5-membered unsubstituted heteroaryl it is selected from a 5-membered unsubstituted heteroaryl having either one or two heteroatoms; R_5 is selected from the group consisting of C_1 to C_{20} haloalkyl, C_1 to C_{20} haloalkenyl, a fluorine-containing group, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_1 to C_{20} alkoxy, ester, amide, C_1 to C_{20} alkanoyl, C_1 to C_{20} alkenoyl, aryl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted, wherein substituted in the above definitions of R_1, R_2, R_3, R_4 and R_5 includes substitution with a substituent selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl, carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl; and wherein R_3 and R_4 are not ethyl; when one of R_3 or R_4 is alkyl then the other cannot be hydrogen or methyl; R_5 does not comprise a double bond adjacent the carbonyl carbon to which R_5 is attached; when R_5 is phenyl then it is not para-substituted with a nitro group; and R_3 or R_4 do not form a ring structure or fused ring structure with R_1 and/or R_2. In another example, the present disclosure refers to a compound of formula II, or a salt or

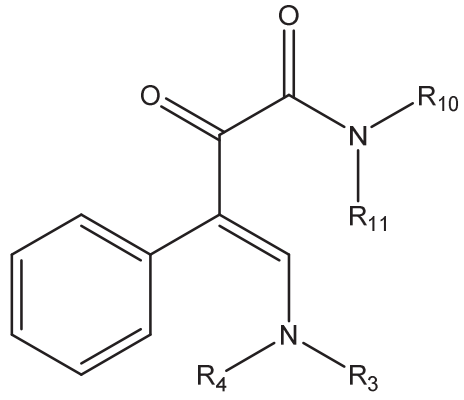


cis-trans isomer thereof (formula II) wherein, R_1 is selected from the group consisting of C_1 to C_6 alkyl, aryl, aroyl, and C_5 to C_7 cycloalkenyl; R_3 and R_4 are independently as defined in any one of the preceding claims; Y_1, Y_2, Y_3, Y_4 and Y_5 are independently selected from a nitrogen or a carbon atom; and each incidence of R_6 is independently selected from the group consisting of hydrogen, hydroxyl, halo, nitro, cyano, C_1 to C_{12} alkyl, C_1 to C_{12} alcohol, C_2 to C_{12} alkenyl, C_1 to C_{12} alkoxy, alkoxysilane, C_1 to

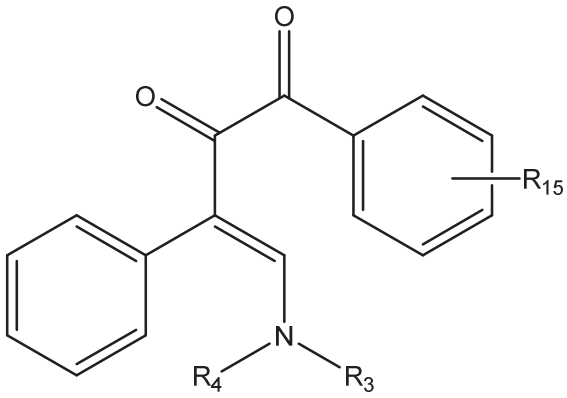
C_6 amide, sulphonamide, and C_1 to C_{12} haloalkyl, each of which may be substituted or unsubstituted. In yet another example, the present disclosure refers to a compound of formula III, or a salt or cis-trans isomer thereof



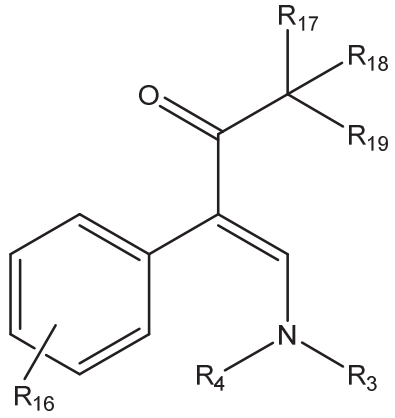
(formula III) wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and R_9 is selected from the group consisting of aryl, C_1 to C_{12} alkyl, C_1 to C_{12} alkyl aryl, C_5 to C_7 cycloalkyl, C_5 or C_6 heterocycle and C_2 to C_{12} alkylalkanoate, each of which may be substituted or unsubstituted. In a further example, the present disclosure refers to a compound of formula IV, or a salt or cis-trans isomer thereof



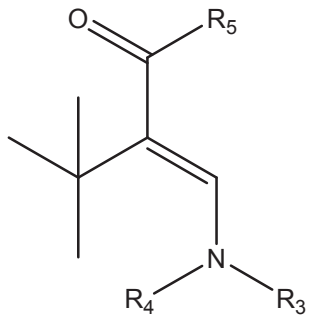
(formula IV) wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and R_{10} and R_{11} are independently selected from the group consisting of hydrogen, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_2 to C_{20} alkynyl, C_1 to C_{20} alkylamine, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkyl, C_3 to C_8 cycloalkenyl, C_2 to C_{12} alkanoyloxy, haloalkyl, and heterocyclic, all of which groups may be substituted or unsubstituted, or R_{10} and R_{11} may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being optionally substituted. In another example, the present disclosure refers to a compound of formula V, or a salt or cis-trans isomer thereof



(formula V) wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and each incidence of R_{15} is independently selected from the group consisting of hydrogen, hydroxyl, halo, nitro, cyano, C_1 to C_{12} alkyl, C_1 to C_{12} alcohol, C_2 to C_{12} alkenyl, C_1 to C_{12} alkoxy, sulphonamide, and C_1 to C_{12} haloalkyl, each of which may be substituted or unsubstituted. In yet another example, the present disclosure refers to a compound of formula VI, or a salt or cis-trans isomer thereof



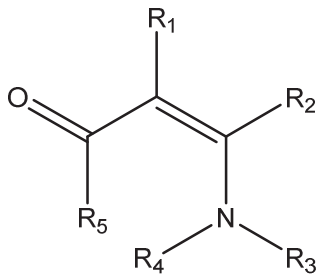
(formula VI) wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and R_{17}, R_{18} and R_{19} are independently selected from methyl, ethyl and propyl; and each incidence of R_{16} is independently selected from the group consisting of hydrogen, hydroxyl, halo, nitro, cyano, C_1 to C_{12} alkyl, C_1 to C_{12} alcohol, C_2 to C_{12} alkenyl, C_1 to C_{12} alkoxy, sulphonamide, and C_1 to C_{12} haloalkyl, each of which may be substituted or unsubstituted. In one example, the present disclosure refers to a compound of formula VII, or a salt or cis-trans isomer



thereof (formula VII) wherein, R_3, R_4 and R_5, as appropriate, are independently as defined in any one of the preceding claims. In yet another aspect, the present disclosure refers to a composition comprising a compound as disclosed herein, or a salt or cis-trans isomer thereof, and a suitable carrier. In a further aspect, the present disclosure refers to the use of a compound as disclosed herein, or a salt or cis-trans isomer thereof, as a UV or visible light electromagnetic energy absorbing compound. In yet another aspect, the present disclosure refers to a method of protecting a surface or tissue from UV rays including the step of applying a compound as disclosed herein, or a salt or cis-trans isomer thereof, to the surface or tissue. It has been found that certain non-cyclic enamine core compounds provide for absorbance across a useful range of the electromagnetic spectrum with a useful variation in molar extinction coefficients or mass extinction coefficients or λ_{max} or λ_{crit} values; and this variance can, to a significant degree, be tailored based on the choice of functional groups extending from the enamine core. Further, these compounds have been advantageously found to demonstrate both a useful degree of photostability and an improved physical stability or general robustness to a range of conditions, including incorporation into lenses. Finally, while providing these advantages the compounds of the invention, due at least in part to their non-cyclic core, are also easily accessible

CLAIMS

1. A compound of formula I, or a salt or cis-trans isomer thereof:



formula I

wherein, R_1 is selected from the group consisting of phenyl, pyridyl, pyran, thiopyran, diazine, oxazine, thiazine, dioxine, dithiine, pyrrole, furan, thiophene, imidazole, pyrazole, oxazole, isoxazole, thiazole, isothiazole, indole and isoindole, each of which groups may be substituted or unsubstituted; or optionally wherein R_1 is substituted with a moiety selected from halo, C_1 to C_{12} alkyl, C_1 to C_{12} alkoxy, C_2 to C_{12} alkenyl and enamine to form a divalent presentation of a further compound of formula I, each of which groups may themselves be substituted or unsubstituted;

R_2 is selected from the group consisting of hydrogen, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted; or optionally wherein R_2 is phenyl substituted with a moiety selected from the group consisting of C_1 to C_6 alkyl, C_1 to C_6 alkoxy, halo and C_1 to C_6 haloalkyl;

R_3 and R_4 are independently selected from the group consisting of unsubstituted or substituted C_1 to C_{20} alkyl, unsubstituted or substituted C_2 to C_{20} alkenyl, unsubstituted or substituted C_2 to C_{20} alkynyl, unsubstituted or substituted C_1 to C_{20} alkylamine, substituted aryl, unsubstituted or substituted heteroaryl, unsubstituted or substituted aroyl, unsubstituted or substituted C_5 to C_7 cycloalkyl, unsubstituted or substituted C_3 to C_8 cycloalkenyl, unsubstituted or substituted C_2 to C_{12} alkanoyloxy, unsubstituted or substituted haloalkyl, and unsubstituted or substituted heterocyclic, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being substituted; or optionally wherein the cyclic structure formed by R_3 and R_4 is substituted with a moiety selected from the group consisting of halo, nitro, cyano, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, C_1 to C_{12} haloalkyl, -N-alkyl, C_1 to C_{12} alkoxy, C_1 to C_{12}

alkylalkanoate, C_1 to C_6 haloalkyl, C_5 or C_6 aryl, C_5 or C_6 heteroaryl, C_5 or C_6 heterocyclic and enamine, to form a divalent presentation of a further compound of formula I or formula II, each of which groups may themselves be substituted or unsubstituted;

R_5 is selected from the group consisting of C_1 to C_{20} haloalkyl, C_1 to C_{20} haloalkenyl, a fluorine-containing group, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_1 to C_{20} alkoxy, ester, amide, C_1 to C_{20} alkanoyl, C_1 to C_{20} alkenoyl, aryl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted; or optionally wherein R_5 is a substituted C_5 or C_6 aryl and the substituent(s) is selected from the group consisting of C_1 to C_6 alkyl, C_1 to C_6 alkoxy, hydroxyl, nitro, cyano, and halo;

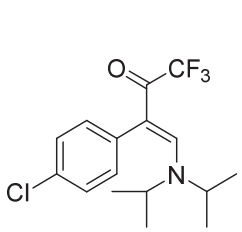
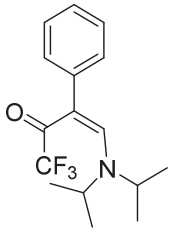
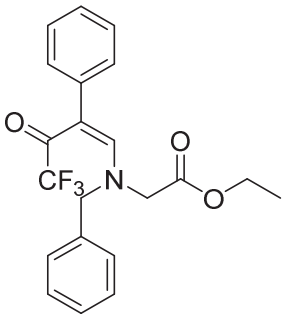
wherein, unless otherwise stated, substituted in the above definitions of R_1, R_2, R_3, R_4 and R_5, or a cyclic structure formed by R_3 and R_4 refers to substitution with one or more substituents selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl, carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl, wherein each of these substituents may themselves be substituted with the same or different substituents selected from this list; and

wherein

R_3 and R_4 are not ethyl;

when one of R_3 or R_4 is alkyl then the other cannot be hydrogen or methyl; and

R_3 or R_4 do not form a ring structure or fused ring structure with R_1 and/or R_2; and

the compound of formula I is not  ,  , or  .

2. The compound of claim 1 of formula I, wherein

R_1 is selected from the group consisting of phenyl, pyridyl, pyran, thiopyran, diazine, oxazine, thiazine, dioxine, dithiine, pyrrole, furan, thiophene, imidazole, pyrazole, oxazole, isoxazole, thiazole, isothiazole, indole and isoindole, each of which groups may be substituted or unsubstituted;

R_2 is selected from the group consisting of hydrogen, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted;

R_3 and R_4 are independently selected from the group consisting of unsubstituted or substituted C_1 to C_{20} alkyl, unsubstituted or substituted C_2 to C_{20} alkenyl, unsubstituted or substituted C_2 to C_{20} alkynyl, unsubstituted or substituted C_1 to C_{20} alkylamine, substituted aryl, unsubstituted or substituted heteroaryl, unsubstituted or substituted aroyl, unsubstituted or substituted C_5 to C_7 cycloalkyl, unsubstituted or substituted C_3 to C_8 cycloalkenyl, unsubstituted or substituted C_2 to C_{12} alkanoyloxy, unsubstituted or substituted haloalkyl, and unsubstituted or substituted heterocyclic, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being substituted;

R_5 is selected from the group consisting of C_1 to C_{20} haloalkyl, C_1 to C_{20} haloalkenyl, a fluorine-containing group, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_1 to C_{20}

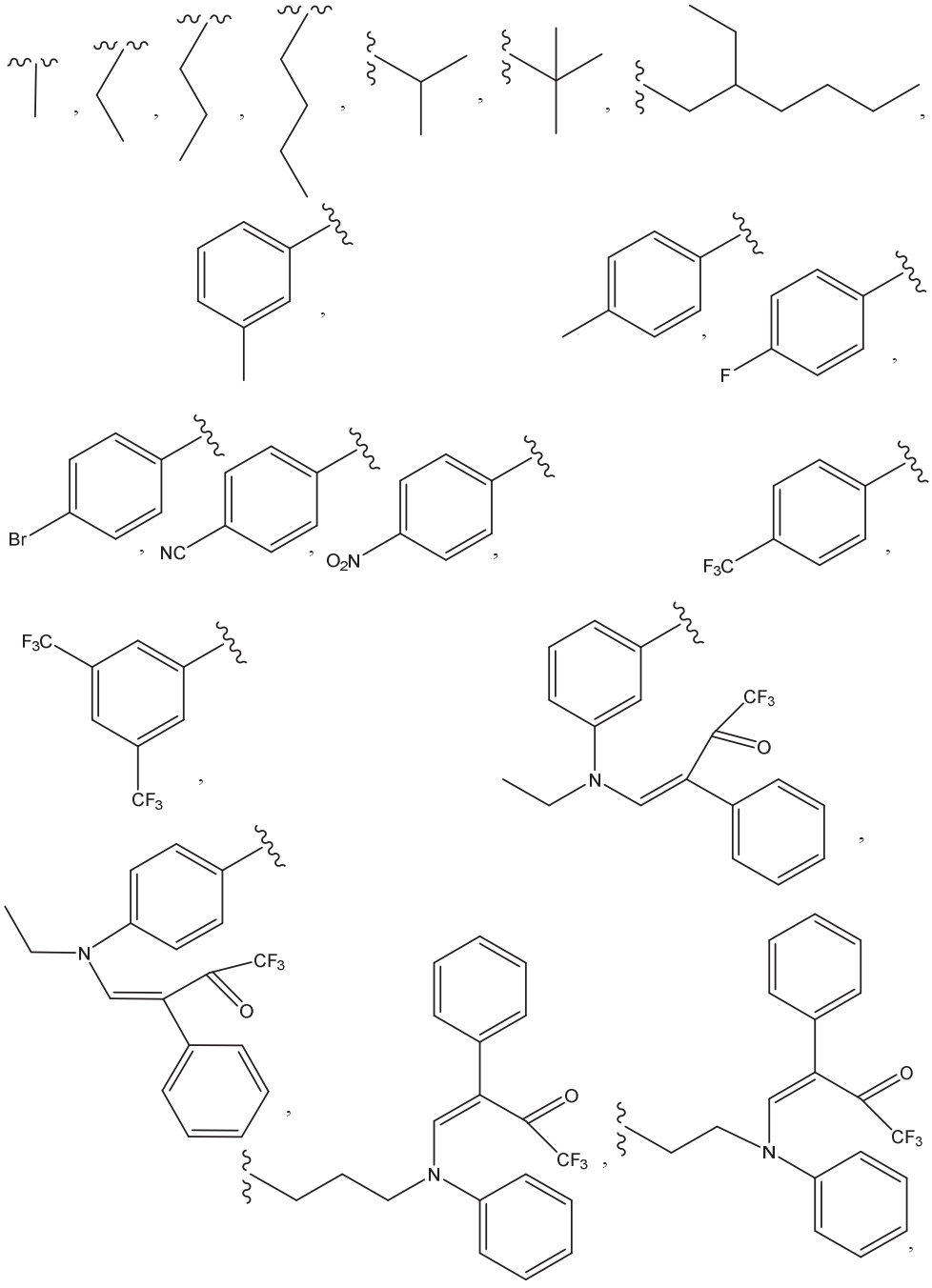
alkoxy, ester, amide, C_1 to C_{20} alkanoyl, C_1 to C_{20} alkenoyl, aryl, C_5 to C_7 cycloalkenyl and heterocyclic, each of which groups may be substituted or unsubstituted;

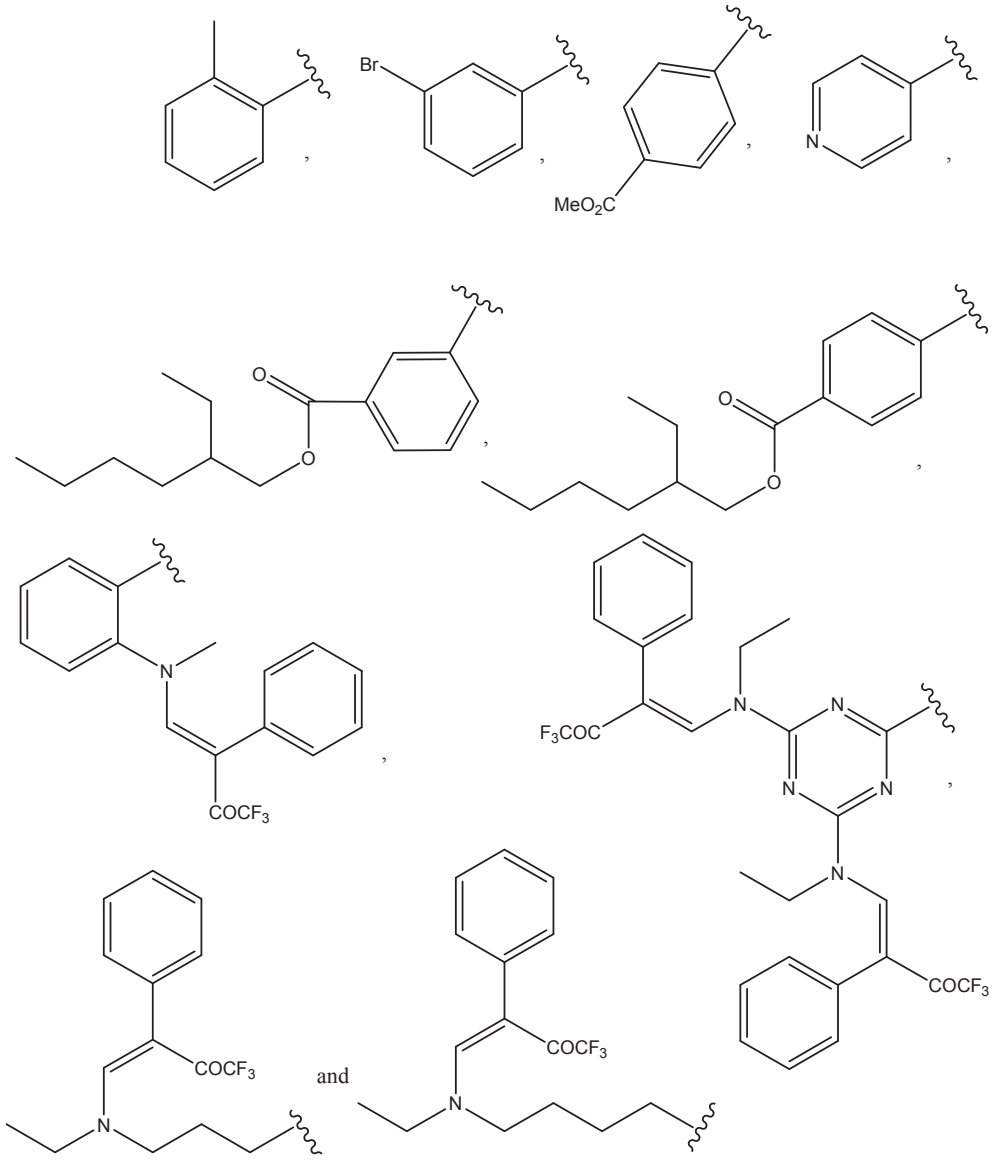
wherein substituted in the above definitions of R_1, R_2, R_3, R_4 and R_5, or a cyclic structure formed by R_3 and R_4, refers to substitution with one or more substituents selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl, carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl, wherein each of these substituents may themselves be substituted with the same or different substituents selected from this list.

3. The compound of claim 1 or claim 2, wherein

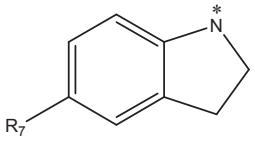
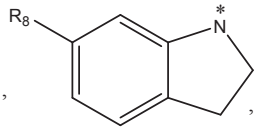
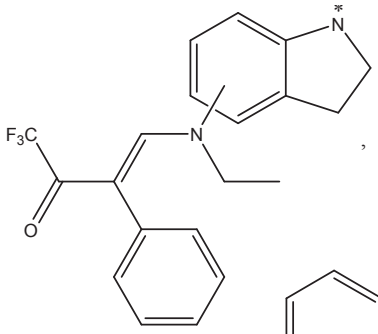
R_1 and R_2 are defined as in claim 1 or as in claim 2,

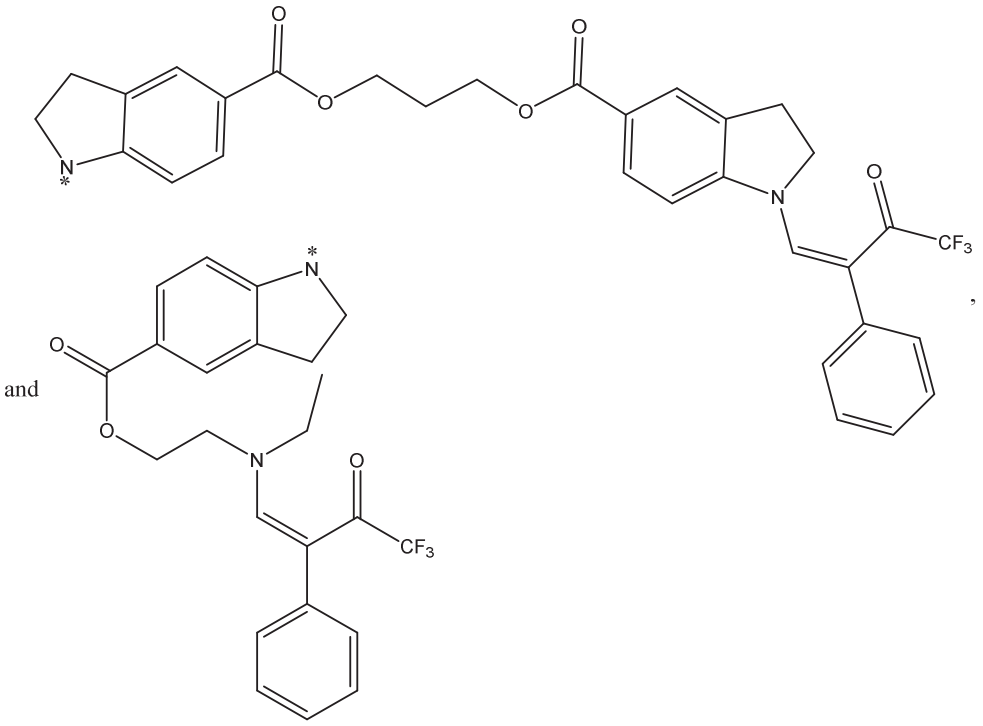
R_3 and R_4 are defined as in claim 1 or as in claim 2; or R_3 and R_4 are independently selected from the group consisting of:


Br
NC
O2N
F
F3C
F3C
CF3
CF3
O
N
CF3
O
N
O
CF3
N
O
CF3



or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being selected from the group consisting of:

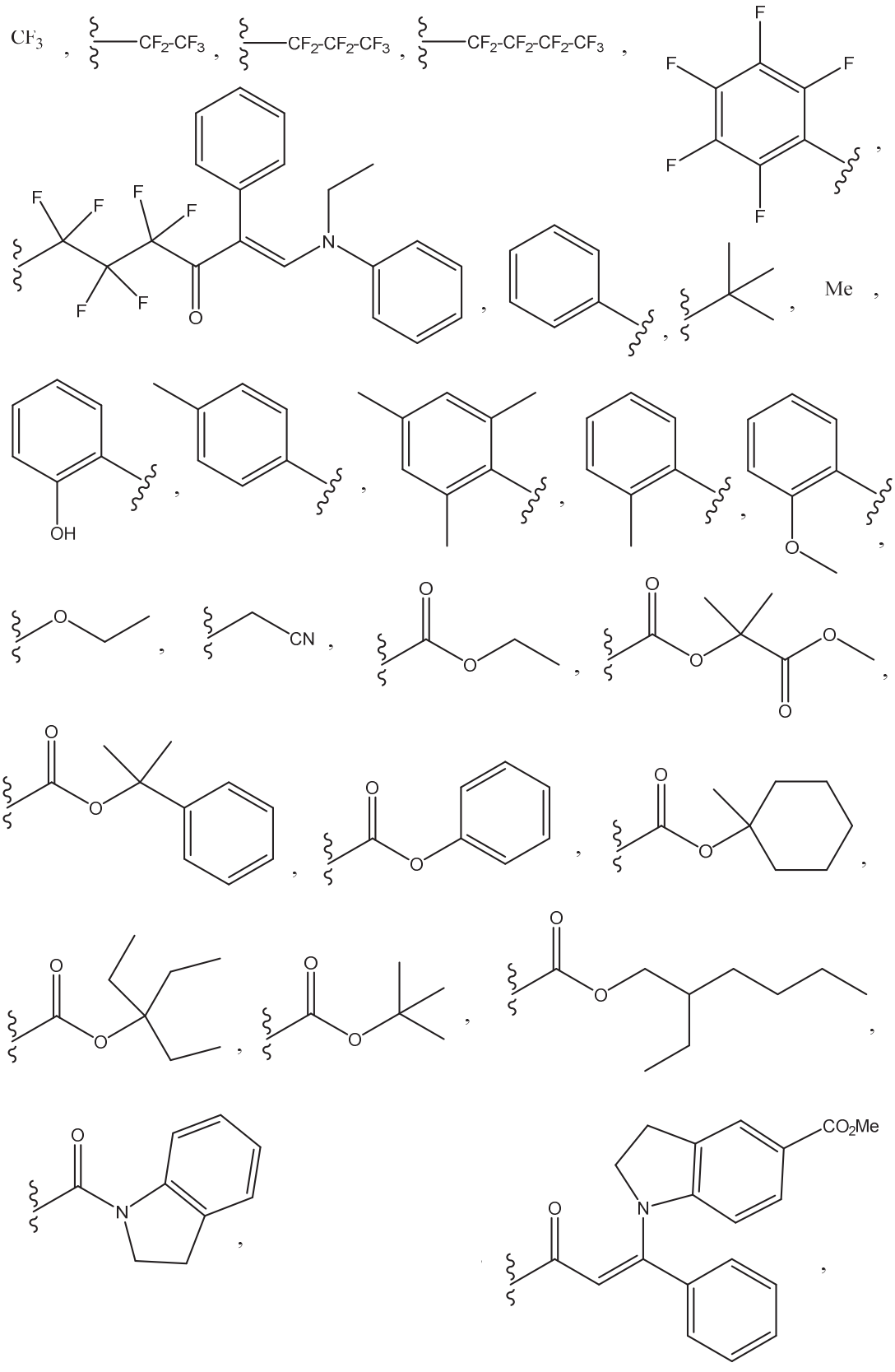


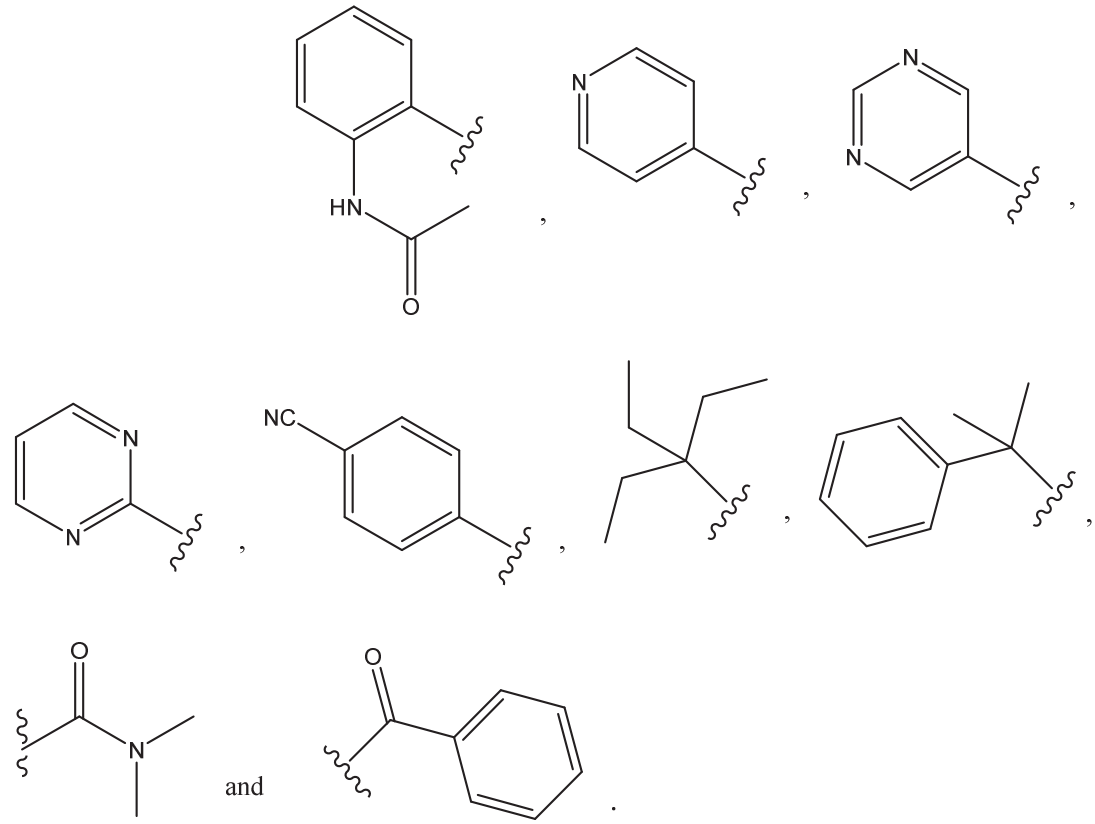
and

wherein, the asterisk indicates the enamine nitrogen atom to which R_3 and R_4 are directly attached; and

R_7 and R_8 are selected from the group consisting of hydrogen, F, Br, Cl, C_1 to C_{20} alkyl, C_1 to C_6 fluoroalkyl, nitro, C_1 to C_6 alkoxy, -C(O)O-C_1 to C_9 alkyl, -C(O)O-C_1 to C_4 alkyl-carbamate, carboxymethyl, carboxyethyl, a multivalent presentation of another compound of formula I, and -C(O)O-PEG, each of which may be optionally substituted;

R_5 is defined as in claim 1 or as in claim 2; or R_5 is selected from the group consisting of:





R_6 is defined as in claim 1,

wherein, unless otherwise stated, substituted in the above definitions of R_1, R_2, R_3, R_4, R_5, R_7, and R_8, or a cyclic structure formed by R_3 and R_4, refers to substitution with one or more substituents selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl, carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl.

4. The compound of claim 1 or claim 2, wherein

R_1, R_2, R_3, R_4, and R_5 are defined as in claim 1 or claim 2,

wherein, unless otherwise stated, substituted in the above definitions of R_1, R_2, R_3, R_4, and R_5, or a cyclic structure formed by R_3 and R4, refers to substitution with one or more substituents selected from the group consisting of alkyl, alkenyl, alkylalkanoate, aryl, alkylaryl, heteroaryl, heterocyclyl, alkynyl, aroyl, alkanone, cycloalkyl, cycloalkaneone, cycloalkenyl, alkanoyl, alkanoyloxy, alkoxycarbonyl, carbamoyl, carboxyl, halo, cyano, nitro, haloalkyl, N-alkyl, N-aryl and N-heterocyclyl.

5. The compound of any one of the preceding claims wherein R_1 is phenyl, substituted or unsubstituted.

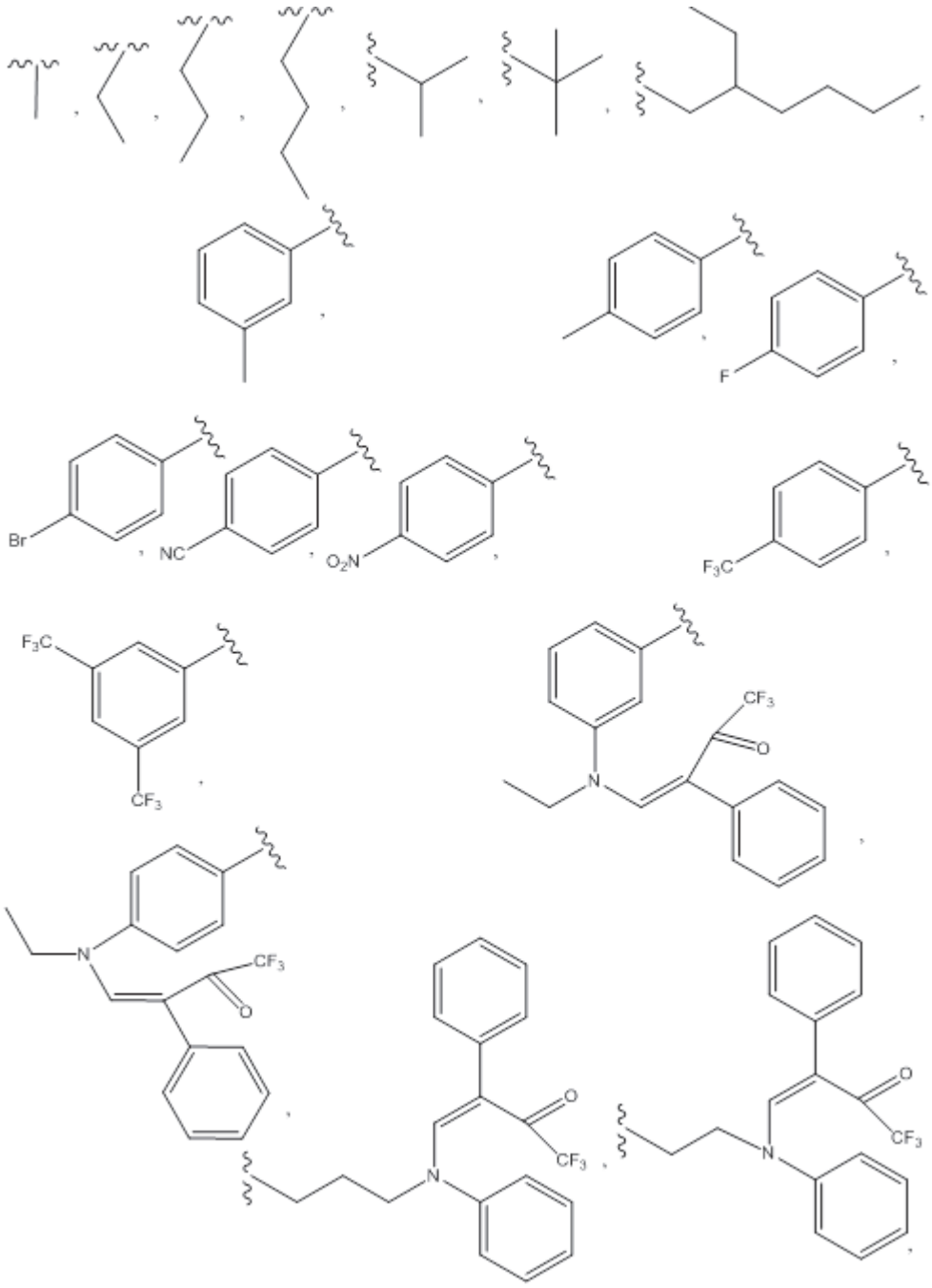
6. The compound of any one of the preceding claims wherein R_2 is selected from the group consisting of hydrogen, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_5 or C_6 aryl, C_5 or C_6 heteroaryl, C_5 or C_6 aroyl, C_5 or C_6 cycloalkenyl and C_5 or C_6 heterocyclic each of which groups may be substituted or unsubstituted.

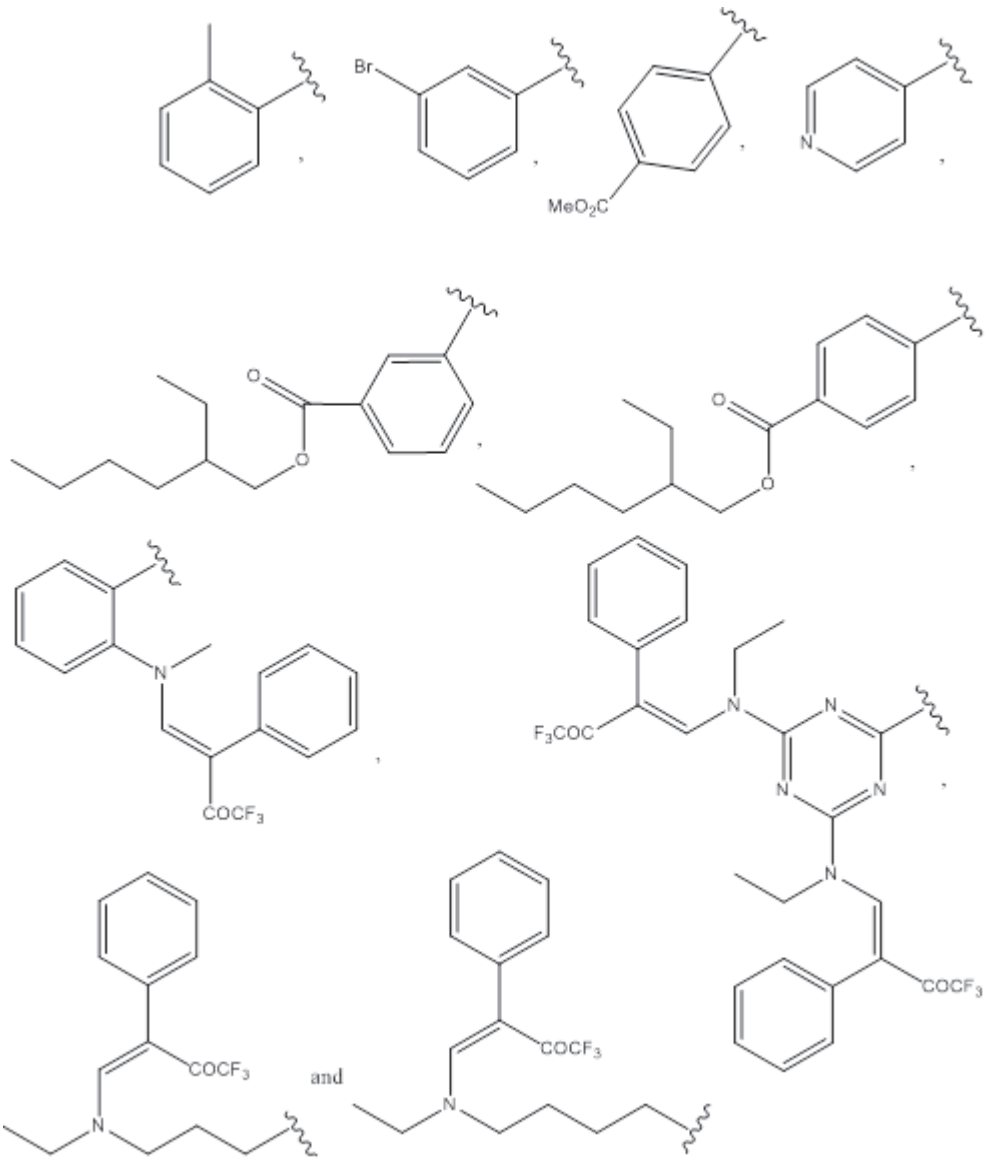
7. The compound of any one of the preceding claims wherein R_3 and R_4 are independently selected from the group consisting of unsubstituted or substituted C_1 to C_{12} alkyl, unsubstituted or substituted C_2 to C_{12} alkenyl, unsubstituted or substituted C_2 to C_{12} alkynyl, unsubstituted or substituted C_1 to C_{12} alkylamine, substituted C_5 to C_7 aryl, substituted biaryl, unsubstituted or substituted bicyclic, unsubstituted or substituted C_5 to C_7 heteroaryl, unsubstituted or substituted C_5 to C_7 aroyl, unsubstituted or substituted C_4 to C_7 cycloalkenyl, and unsubstituted or substituted C_5 to C_7 heterocyclic, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being selected from C_5 to C_7 saturated nitrogen heterocycles and C_5 to C_7 unsaturated nitrogen heterocycles each of which are substituted.

8. The compound of any one of the preceding claims wherein R_3 and R_4 are independently selected from the group consisting of unsubstituted or substituted C_1 to C_9 alkyl, unsubstituted or substituted C_2 to C_9 alkenyl, unsubstituted or substituted C_1 to C_9 alkylamine, substituted phenyl, substituted naphthyl, unsubstituted or substituted triazine, unsubstituted or substituted C_5, C_6 or C_7 nitrogen heterocycle and a divalent presentation of a further compound of formula I, or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being selected from pyrrolidine, piperidine, azepane, homopiperazine, piperazine, each of which are substituted or fused with one or more of C_5 or C_6 aryl, C_5 or C_6 cycloalkyl, C_5 or C_6 heteroaryl or C_5 or C_6 heterocyclic rings, each of which may themselves be substituted or unsubstituted.

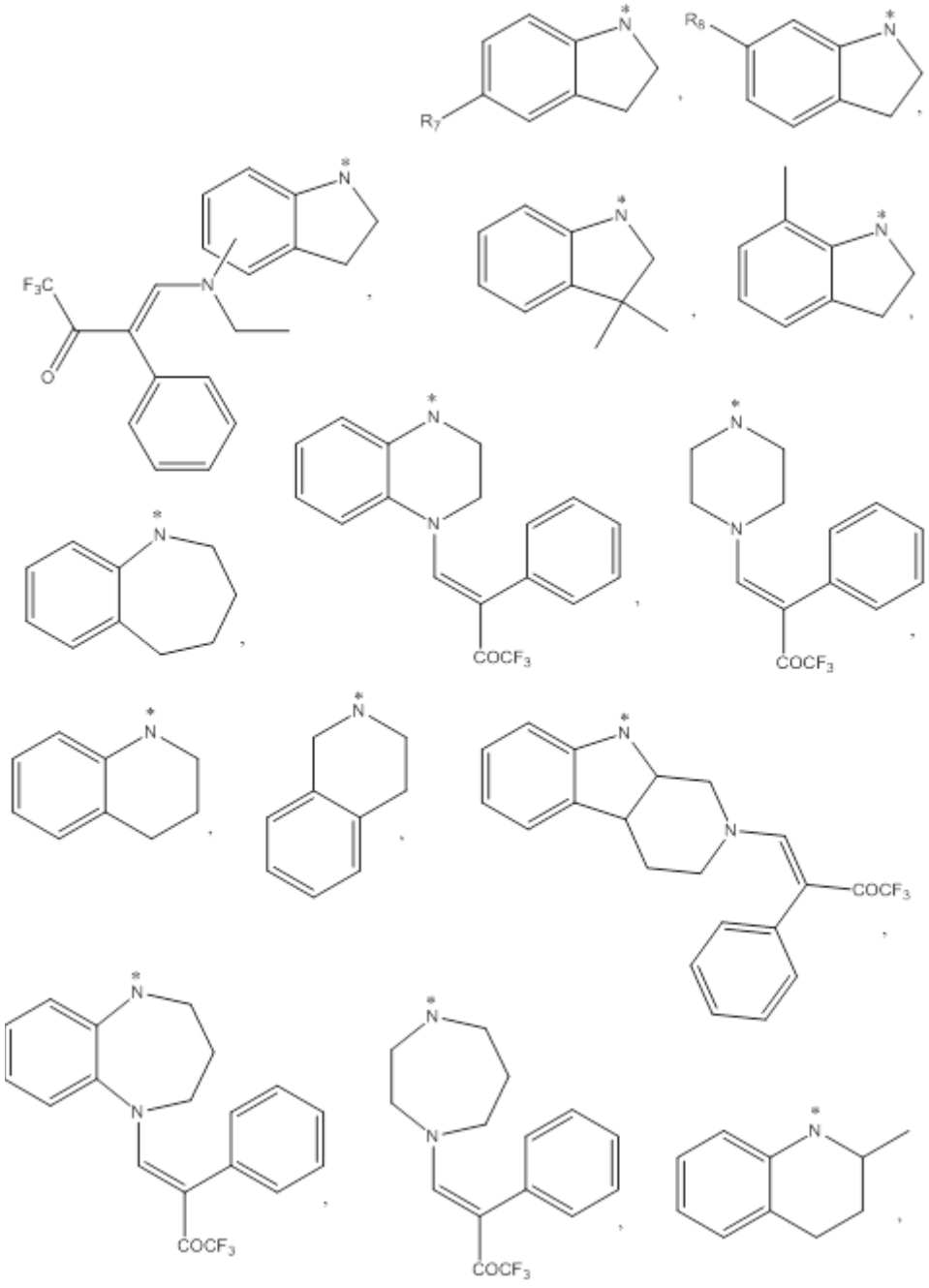
9. The compound of any one of the preceding claims wherein R_3 and R_4 together form a C_5 nitrogen heterocycle fused with a benzene ring, each of which may themselves be substituted or unsubstituted.

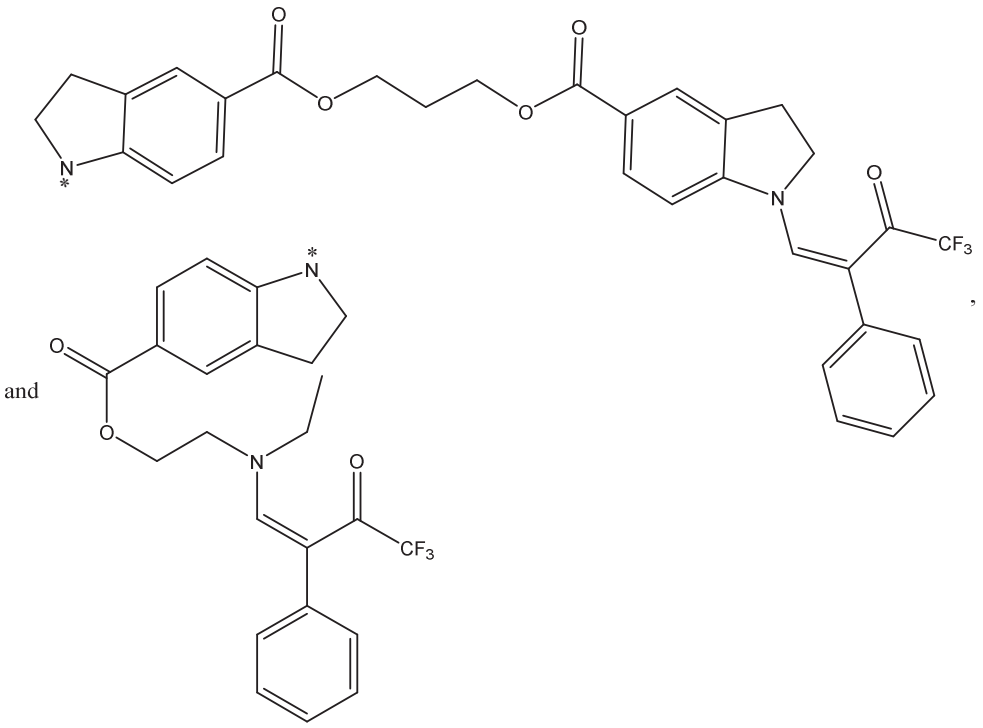
10. The compound of any one of the preceding claims wherein R_3 and R_4 are independently selected from the group consisting of:


Br
NC
O2N
F
F3C
F3C
CF3
CF3
O
N
CF3
O
N
O
CF3
N
O
CF3



or R_3 and R_4 may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being selected from the group consisting of:





and

wherein, the asterisk indicates the enamine nitrogen atom to which R_3 and R_4 are directly attached; and

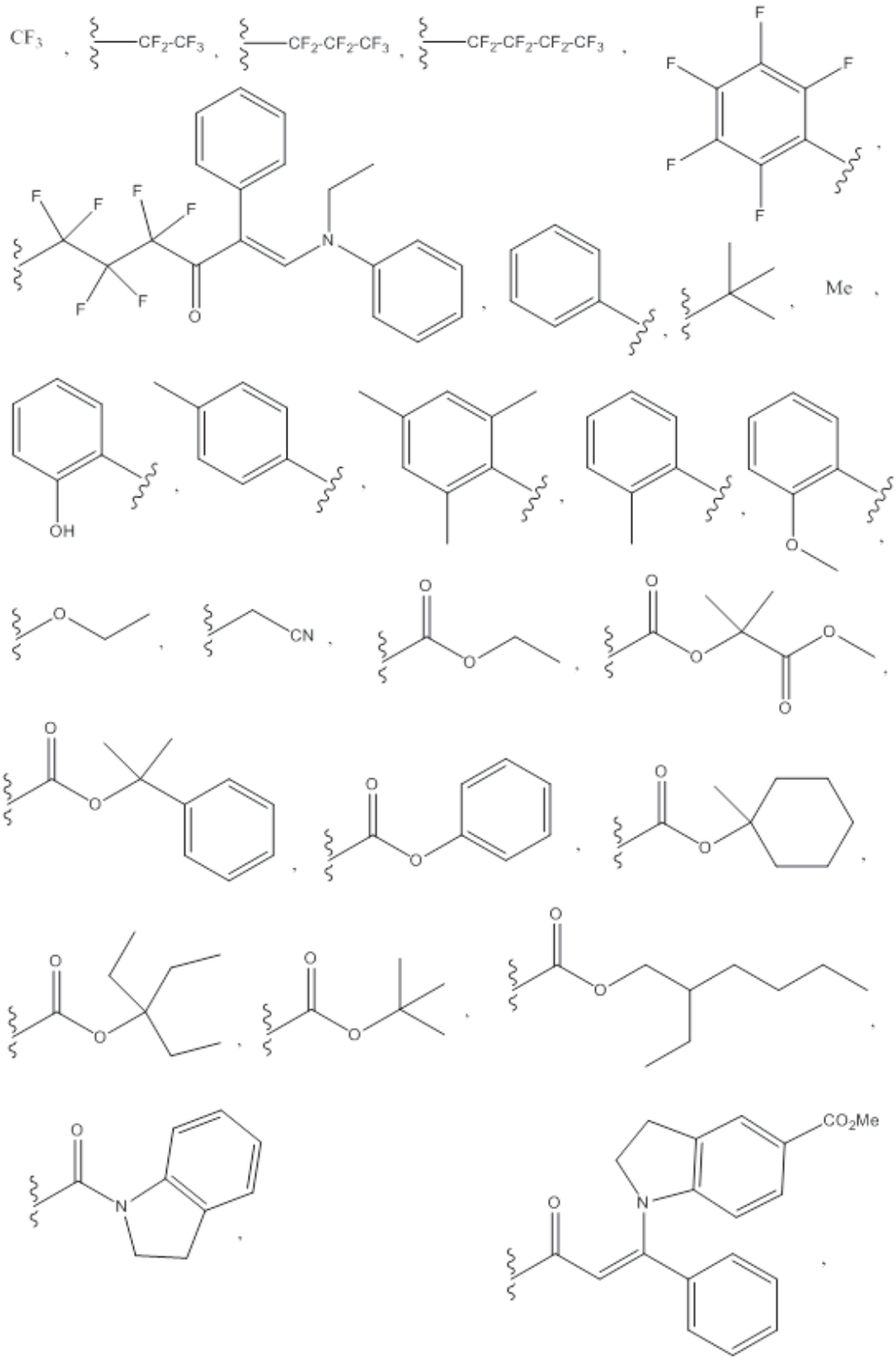
R_7 and R_8 are selected from the group consisting of hydrogen, F, Br, Cl, C_1 to C_{20} alkyl, C_1 to C_6 fluoroalkyl, nitro, C_1 to C_6 alkoxy, -C(O)O-C_1 to C_9 alkyl, -C(O)O-C_1 to C_4 alkyl-carbamate, carboxymethyl, carboxyethyl, a divalent presentation of another compound of formula I, and -C(O)O-PEG, each of which may be optionally substituted.

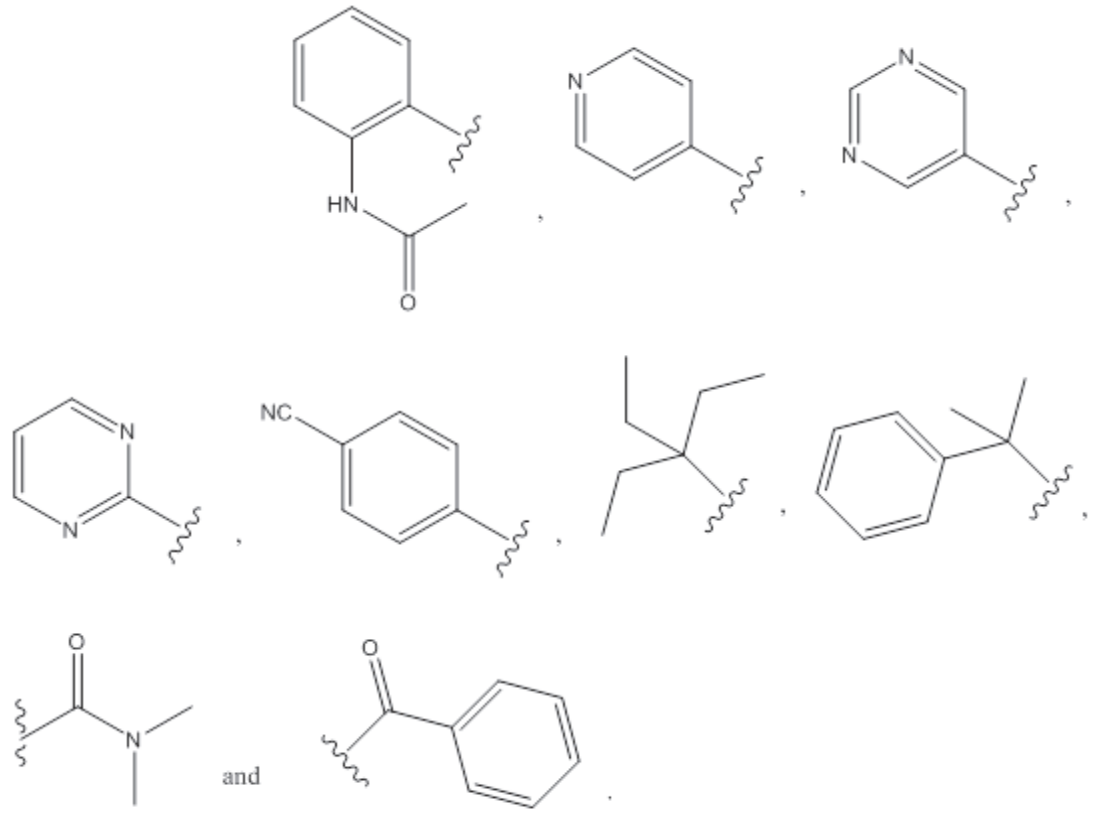
11. The compound of any one of the preceding claims wherein R_5 is selected from the group consisting of C_1 to C_{12} haloalkyl, C_2 to C_{12} haloalkenyl, C_5 or C_6 aryl, C_1 to C_{12} perhaloalkyl, C_1 to C_{12} alkyl, C_1 to C_{12} alkenyl, C_1 to C_{12} alkoxy, C_1 to C_{12} alkanoyl, phenyl, ester, amide, C_5 to C_7 heterocyclic and an enamine as a divalent presentation of a further compound of formula I, all of which groups may be substituted or unsubstituted.

12. The compound of any one of the preceding claims wherein R_5 is selected from the group consisting of C_1 to C_6 fluoroalkyl, C_2 to C_6 fluoroalkenyl, C_5 or C_6 fluoro aryl, C_1 to C_6 perfluoroalkyl, C_1 to C_6 alkyl, C_1 to C_9 alkenyl, C_1 to C_6 alkoxy, C_1 to C_9 alkanoyl, C_1 to C_6 cyanoalkyl, phenyl, C_1 to C_9 ester, C_1 to C_9 amide, C_5 to C_7 heterocyclic and an enamine as a divalent presentation of a further compound of formula I, all of which groups may be substituted or unsubstituted.

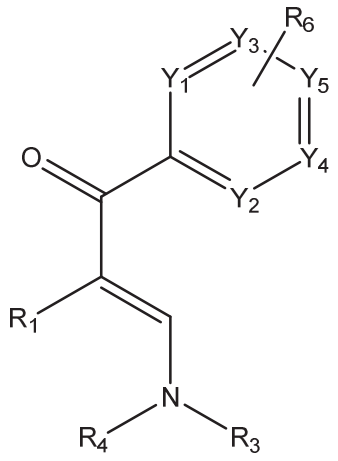
13. The compound of claim 10 or claim 11 wherein when R_5 is amide then the nitrogen of the amide may form part of a 5- or 6-membered nitrogen heterocycle which may be substituted or fused with an aryl ring.

14. The compound of any one of the preceding claims wherein R_5 is selected from the group consisting of:





15. A compound of any one of the preceding claims, wherein the compound is a compound of formula II, or a salt or cis-trans isomer thereof:



formula II

wherein, R_1 is aryl;

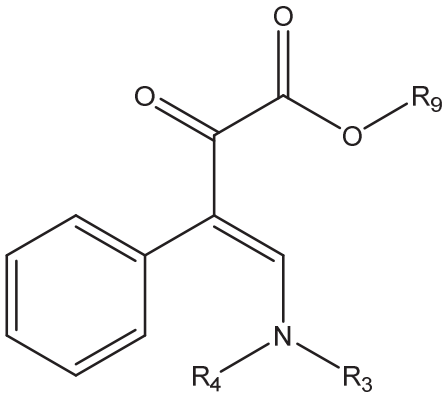
R_3 and R_4 are independently as defined in any one of the preceding claims;

Y_1, Y_2, Y_3, Y_4 and Y_5 are independently selected from a nitrogen or a carbon atom; and

each incidence of R_6 is independently selected from the group consisting of hydrogen, halo, nitro, cyano, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, C_1 to C_{12} alkoxy, C_1 to C_6 amide, and C_1 to C_{12} haloalkyl, each of which may be substituted or unsubstituted.

16. The compound of claim 15 wherein each incidence of R_6 is independently selected from the group consisting of hydrogen, Br, F, Cl, nitro, cyano, C_1 to C_9 alkyl, C_2 to C_9 alkenyl, C_1 to C_9 alkoxy, and C_1 to C_9 haloalkyl, each of which may be substituted or unsubstituted.

17. A compound of any one of the preceding claims, wherein the compound is a compound of formula III, or a salt or cis-trans isomer thereof:



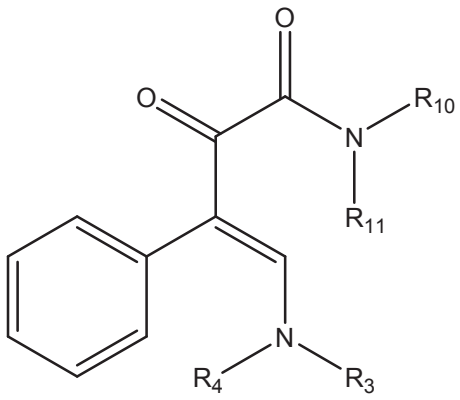
formula III

wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and

R_9 is selected from the group consisting of aryl, C_1 to C_{12} alkyl, C_1 to C_{12} alkyl aryl, C_5 to C_7 cycloalkyl, C_5 or C_6 heterocycle and C_2 to C_{12} alkylalkanoate, each of which may be substituted or unsubstituted.

18. The compound of claim 17 wherein R_9 is selected from C_5 or C_6 aryl, C_1 to C_9 alkyl, C_1 to C_6 alkyl aryl, C_5 or C_6 cycloalkyl, C_5 or C_6 nitrogen heterocycle and C_2 to C_9 alkylalkanoate, each of which may be substituted or unsubstituted.

19. A compound of any one of the preceding claims, wherein the compound is a compound of formula IV, or a salt or cis-trans isomer thereof:



formula IV

wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and

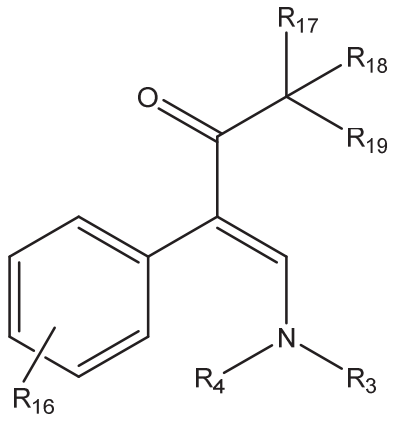
R_{10} and R_{11} are independently selected from the group consisting of hydrogen, C_1 to C_{20} alkyl, C_2 to C_{20} alkenyl, C_2 to C_{20} alkynyl, C_1 to C_{20} alkylamine, aryl, heteroaryl, aroyl, C_5 to C_7 cycloalkyl, C_3 to C_8 cycloalkenyl, C_2 to C_{12} alkanoyloxy, haloalkyl, and heterocyclic, all of which groups may be substituted or unsubstituted, or R_{10} and R_{11} may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being optionally substituted.

20. The compound of claim 19 wherein R_{10} and R_{11} are independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, C_2 to C_{12} alkynyl, C_1 to C_{12} alkylamine, C_5 to C_7 aryl, biaryl, bicyclic, C_5 to C_7 heteroaryl, C_5 to C_7 aroyl, C_4 to C_7 cycloalkenyl, and C_5 to C_7 heterocyclic, all of which groups may be substituted or unsubstituted, or R_{10} and R_{11} may together form a cyclic structure which includes the nitrogen atom to which they are attached, said cyclic structure being selected from C_5 to C_7 saturated nitrogen heterocycles and C_5 to C_7 unsaturated nitrogen heterocycles each of which may be optionally substituted.

21. The compound of claim 19 or claim 20 wherein R_{10} and R_{11} may be independently selected from hydrogen, C_6 aryl or biaryl, C_1 to C_6 alkyl, C_1 to C_{12} alkylamine, each of which groups may be substituted or unsubstituted, and C_5, C_6 or C_7 nitrogen heterocycle each of which heterocycles may be optionally fused with a substituted or unsubstituted benzene ring.

22. The compound of any one of claim 19 to claim 21 wherein, when R_{10} and R_{11} together form a C_5 nitrogen heterocycle fused with a benzene ring, then the structure formed is an indoline which is optionally substituted.

23. A compound of any one of the preceding claims, wherein the compound is a compound of formula VI, or a salt or cis-trans isomer thereof:



formula VI

wherein, R_3 and R_4 are independently as defined in any one of the preceding claims; and

R_{17}, R_{18} and R_{19} are independently selected from methyl, ethyl and propyl; and

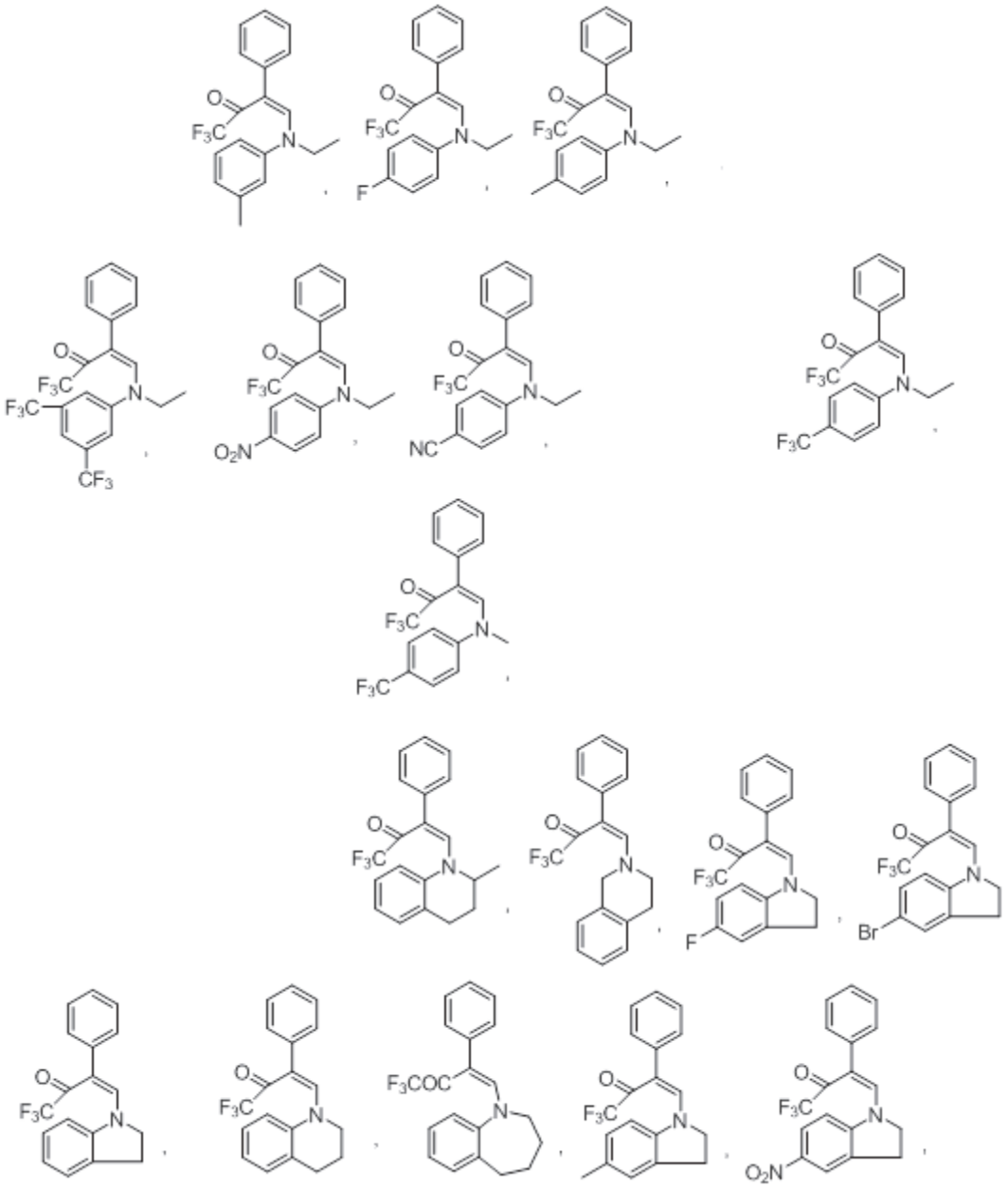
each incidence of R_{16} is independently selected from the group consisting of hydrogen, halo, nitro, cyano, C_1 to C_{12} alkyl, C_2 to C_{12} alkenyl, C_1 to C_{12} alkoxy, and C_1 to C_{12} haloalkyl, each of which may be substituted or unsubstituted.

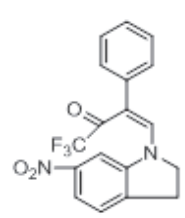
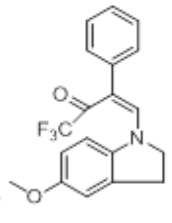
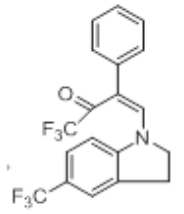
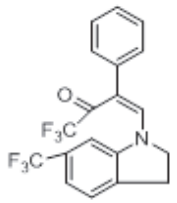
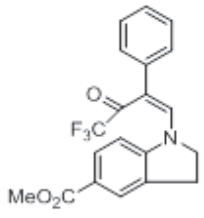
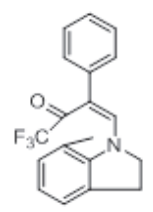
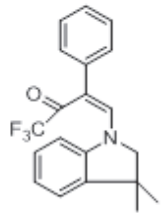
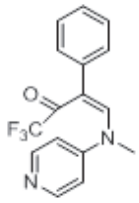
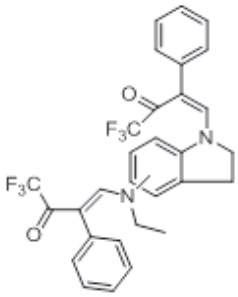
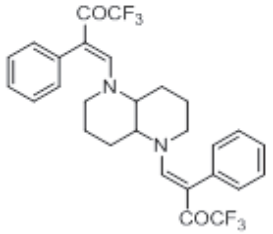
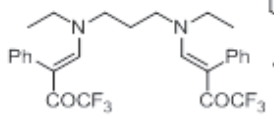
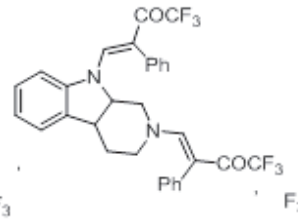
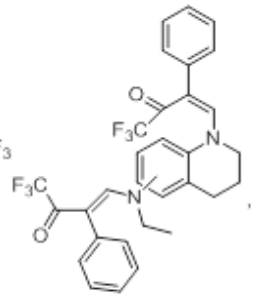
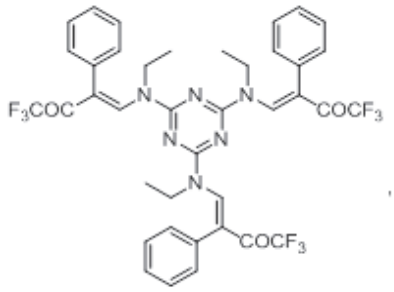
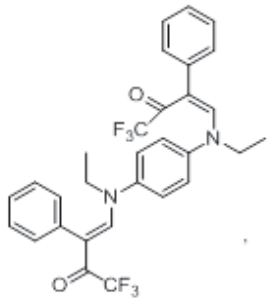
24. The compound of claim 23 wherein each incidence of R_{16} is independently selected from the group consisting of hydrogen, Br, F, Cl, nitro, cyano, C_1 to C_9 alkyl, C_2 to C_9 alkenyl, C_1 to C_9 alkoxy, and C_1 to C_9 haloalkyl, each of which may be substituted or unsubstituted.

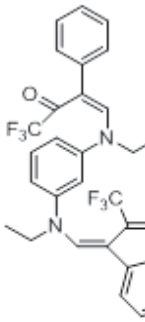
25. The compound of claim 23 or claim 24 wherein R_{16} is hydrogen and R_3 and R_4 together form an optionally substituted indoline ring system.

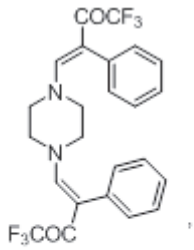
26. The compound of any one of the preceding claims wherein R_3 and R_4 are independently selected from the group consisting of substituted or unsubstituted C_1 to C_6 alkyl and substituted C_5 or C_6 aryl, or may together form a substituted or unsubstituted indoline group.

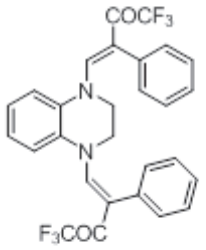
27. The compound of any one of the preceding claims wherein the compound is selected from the group consisting of:

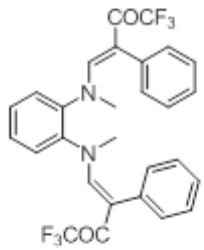


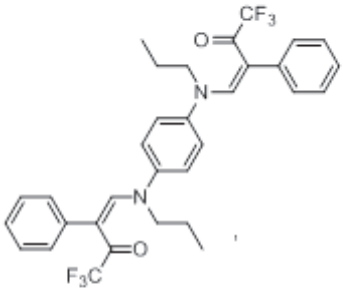
















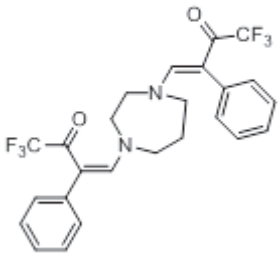


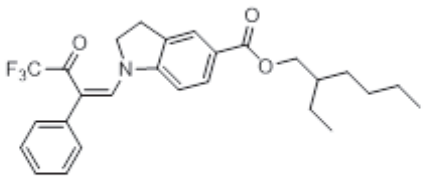


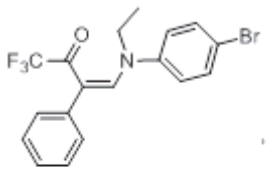


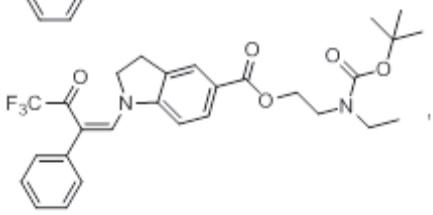


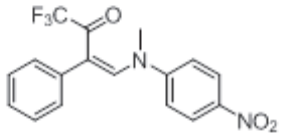


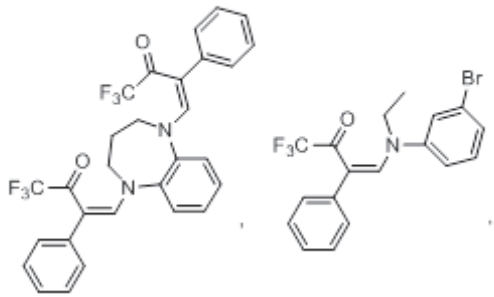


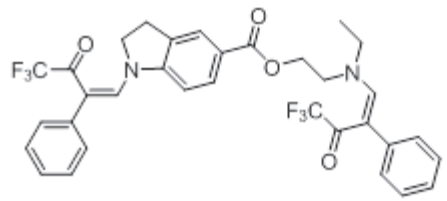


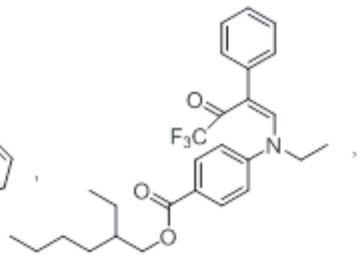


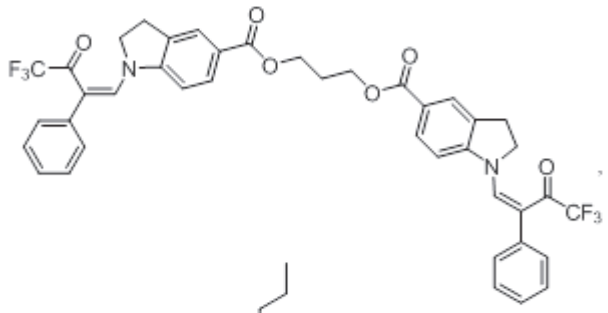


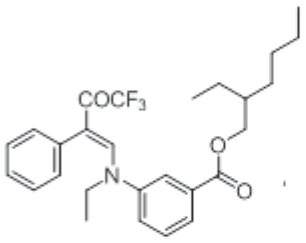


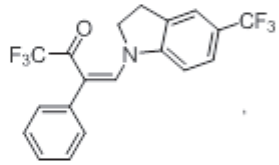


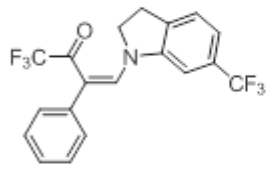


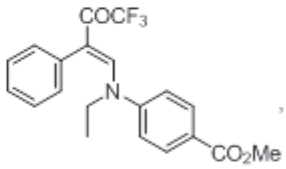


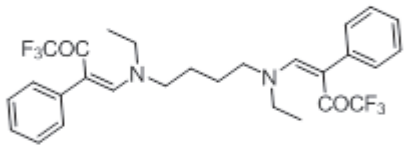


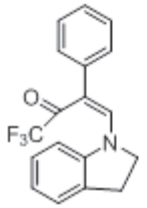


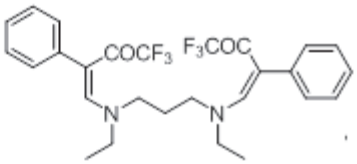


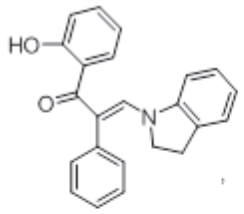
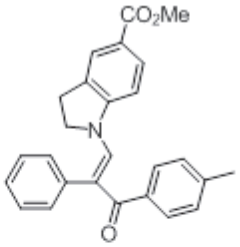
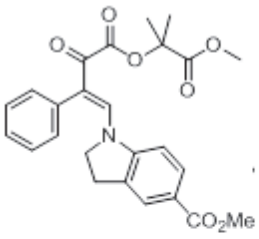


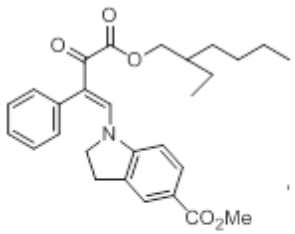


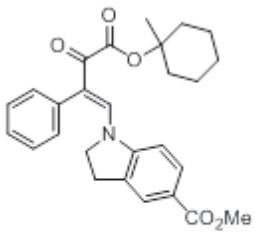


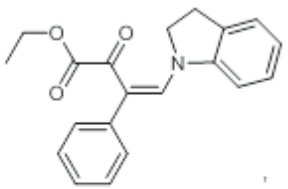


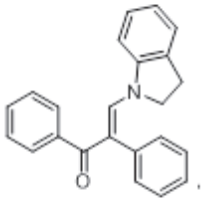


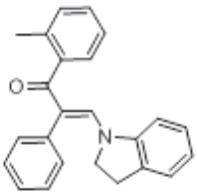




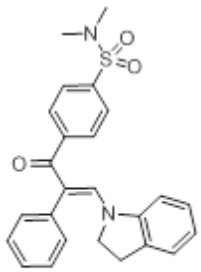


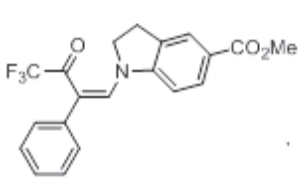


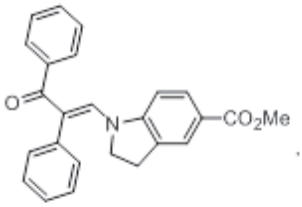


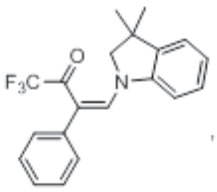


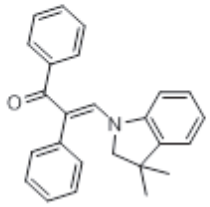


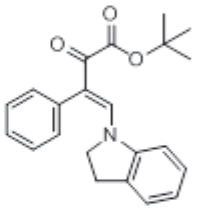


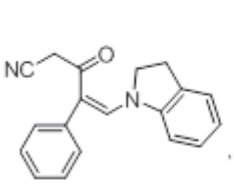


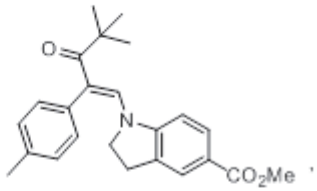


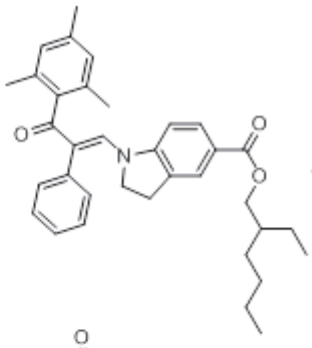


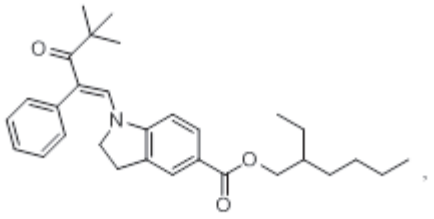


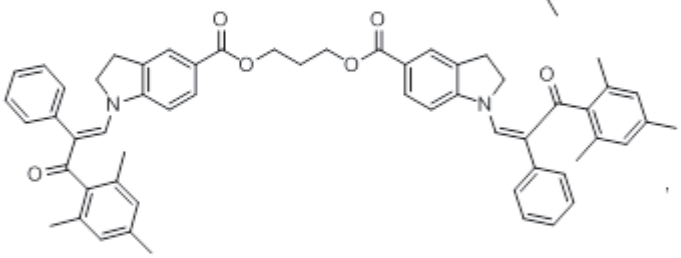


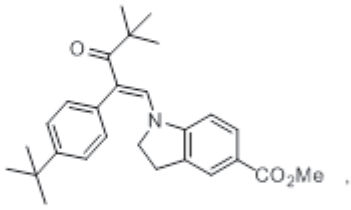


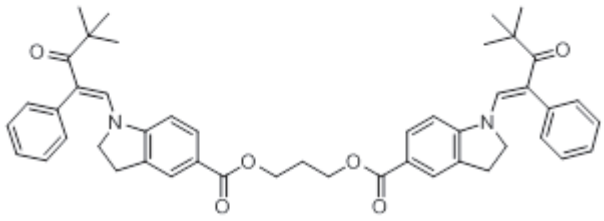


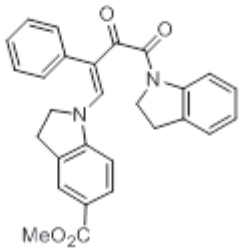


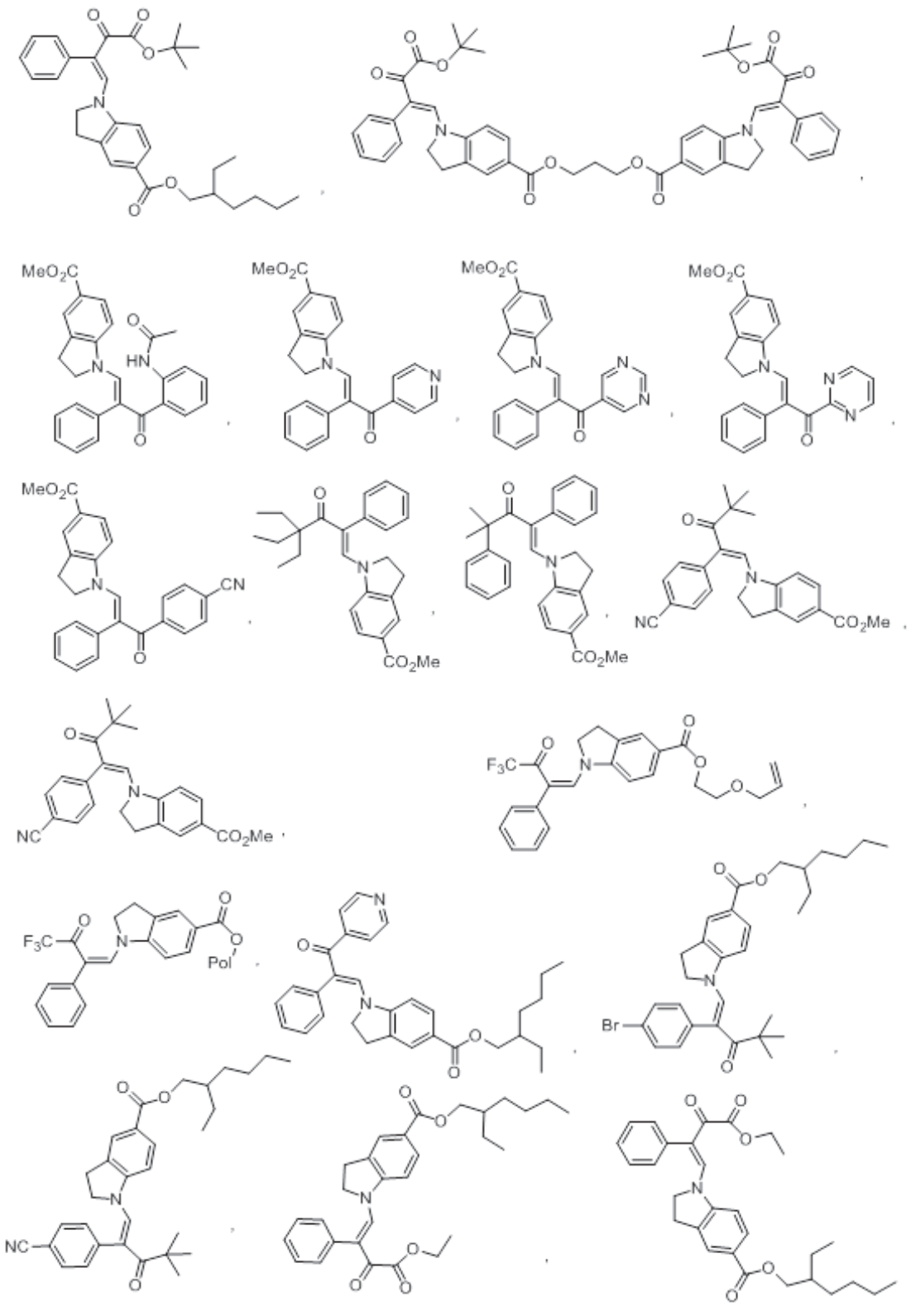












and salts and/or cis-trans isomers thereof, wherein 'Pol' is selected from the group consisting of PEG or C_6 to C_{20} alkyl and wherein a bond extending from within a ring

structure indicates that bond may be connected directly to any of the ring atoms of that structure, as appropriate.

28. A composition comprising a compound of any one of claim 1 to claim 27, or a salt or cis-trans isomer thereof, and a suitable carrier.

29. The composition of claim 28, wherein the composition is selected from the group consisting of a sunscreen composition, a coating composition, a detergent composition, a hair care composition, a packaging composition, a lens-forming composition and a glass or polymeric film-forming composition.

30. Use of a compound of any one of claim 1 to claim 29, or a salt or cis-trans isomer thereof, as a UV or visible light electromagnetic energy absorbing compound.

31. The use of claim 30 wherein the electromagnetic energy is UV-A, UV-B, visible or any combination thereof.

32. The use of claim 30 or 31 wherein the use is as a component of one or more of a sunscreen composition, a coating composition, a detergent composition, a hair care composition, a packaging composition, a lens-forming composition and a glass or polymeric film-forming composition.

33. The use of claim 32 in the formation of a UV or visible light protective ophthalmic lens or UV or visible light protective coating for glass or plastic.

34. A method of protecting a surface or tissue from UV rays including the step of applying a compound of any one of claim 1 to claim 27, or a salt or cis-trans isomer thereof, to the surface or tissue.

35. The method of claim 34 wherein the surface is selected from a surface of a fabric, clothing material, lens, plastic, timber, masonry and glass.

36. The method of claim 34 wherein the tissue is the skin of a mammal.