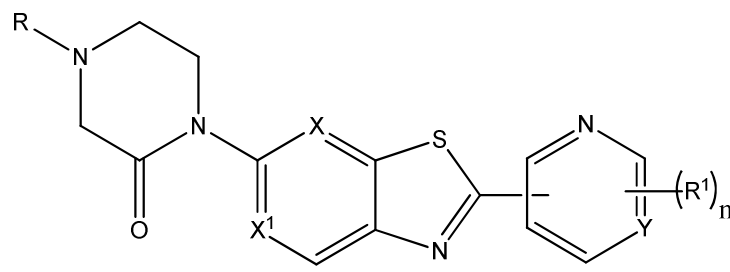


1. In one aspect, [the present disclosure refers to a compound of formula \(I\):](#)

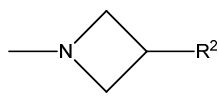
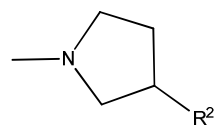
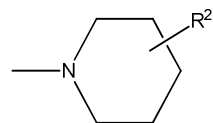


(I)

5 [and stereoisomers, racemic mixtures, pharmaceutically acceptable salts, hydrates, solvates and polymorphs thereof, optionally wherein the compound is detectably labelled; wherein](#)

[R is selected from the group consisting of hydrogen and alkyl;](#)

[R¹ is independently selected from the group consisting of fluorine,](#)



[and -NR³R⁴;](#)

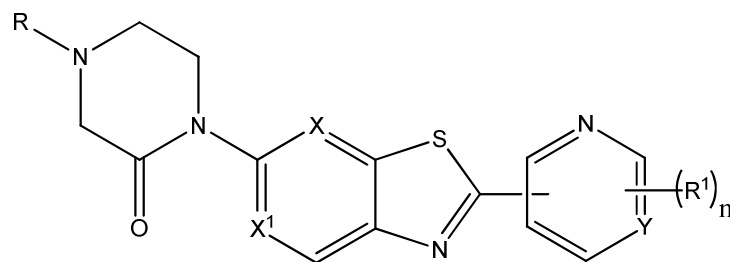
[R² is selected from the group consisting of fluorine and hydrogen;](#)

[R³ and R⁴ are independently selected from the group consisting of alkyl, fluoro-alkyl, alkyl-O-alkyl and hydrogen;](#)

[X and X¹ are independently selected from the group consisting of N and CH, provided that at least one of X and X¹ is N;](#)

[Y is independently selected from the group consisting of N and CH or Y is C if Y is attached to R¹; n is 1 or 2.](#)

[In one example,](#) the present disclosure refers to a compound of formula (I):



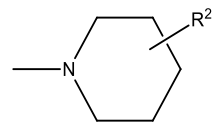
(I)

and detectably labeled derivatives, stereoisomers, racemic mixtures, pharmaceutically acceptable salts, hydrates, solvates, prodrugs and polymorphs thereof;

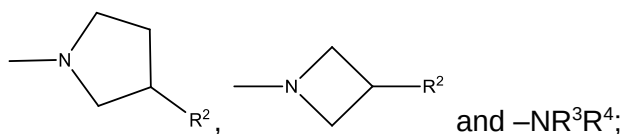
5 wherein

R is selected from the group consisting of hydrogen and alkyl;

R¹ is independently selected from the group consisting of fluorine,



10



R² is selected from the group consisting of fluorine and hydrogen;

15

R³ and **R**⁴ are independently selected from the group consisting of alkyl, fluoro-alkyl, alkyl-O-alkyl and hydrogen;

X and **X**¹ are independently selected from the group consisting of N and CH, provided that at least one of **X** and **X**¹ is N;

20

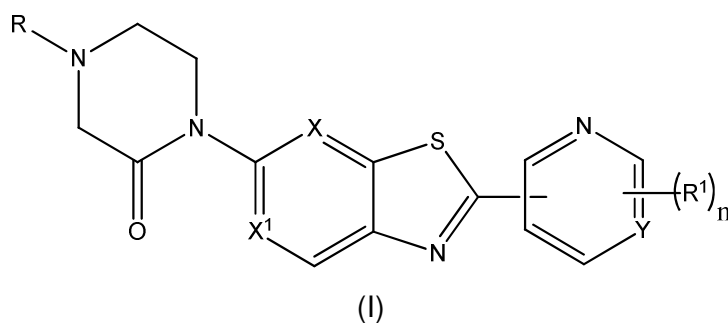
Y is independently selected from the group consisting of N and CH or **Y** is C if **Y** is attached to **R**¹;

50. A method for preparing the compound according to item 5, wherein the compound is labelled by ^{18}F , comprising reacting the compound according to item 47 with a ^{18}F -fluorinating agent, so that **LG** is replaced by ^{18}F . In yet another aspect, the present disclosure refers to a method for preparing the compound as disclosed herein, wherein the compound is labelled by ^{18}F , comprising reacting the compound ~~according to claim 11 as disclosed herein~~ with a ^{18}F -fluorinating agent, so that **LG** is replaced by ^{18}F , preferably wherein the ^{18}F -fluorinating agent is selected from K^{18}F , H^{18}F , Cs^{18}F , Na^{18}F and tetrabutylammonium [^{18}F]fluoride.

5

CLAIMS

1. A compound of formula (I):

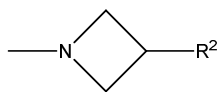
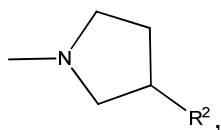


and ~~detectably labeled derivatives~~, stereoisomers, racemic mixtures, pharmaceutically acceptable salts, hydrates, solvates, ~~prodrugs~~ and polymorphs thereof, optionally wherein the compound is detectably labelled;

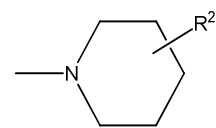
wherein

R is selected from the group consisting of hydrogen and alkyl;

R¹ is independently selected from the group consisting of fluorine,



and $-NR^3R^4$;



R² is selected from the group consisting of fluorine and hydrogen;

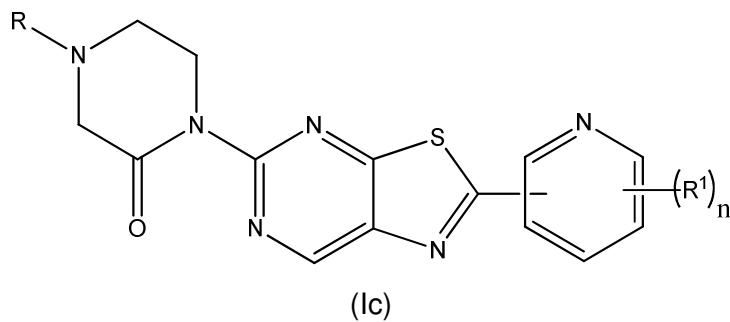
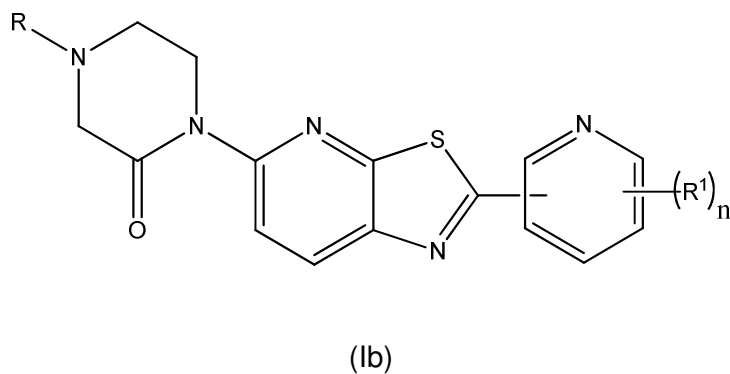
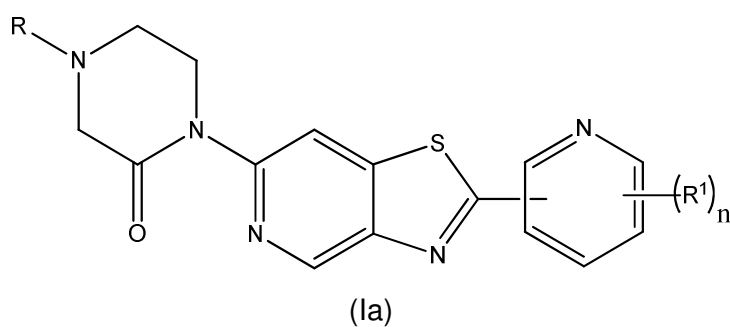
R³ and **R⁴** are independently selected from the group consisting of alkyl, fluoro-alkyl, alkyl-O-alkyl and hydrogen;

X and **X**¹ are independently selected from the group consisting of N and CH, provided that at least one of **X** and **X**¹ is N;

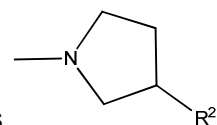
Y is independently selected from the group consisting of N and CH or **Y** is C if **Y** is attached to **R**¹;

n is 1 or 2.

2. The compound according to claim 1, which is a compound of the formula (Ia), (Ib) or (Ic):



wherein **R**, **R**¹ and **n** are as defined in claim 1.



3. The compound according to any one of claims 1 and 2, wherein **R**¹ is
4. The compound according to any one of claims 1 to 3, wherein at least one of **R**¹, **R**², **R**³ and **R**⁴ contains fluorine.
5. The compound according to any one of claims 1 to 4, wherein the compound is detectably labelled, preferably with ²H, ³H, ¹⁸F or ¹³N, more preferably with ¹⁸F.
6. A diagnostic composition comprising a compound according to any one of claims 1 to 5 and optionally a pharmaceutically acceptable carrier, diluent, adjuvant and/or excipient.
7. The compound according to any one of claims 1 to 5 for use in diagnostics.
8. The compound according to any one of claims 1 to 5 for use in the imaging of alpha-synuclein aggregates including, but not limited to, Lewy bodies and/or Lewy neurites, preferably wherein the compound is for use in the positron emission tomography imaging of alpha-synuclein aggregates including, but not limited to, Lewy bodies and/or Lewy neurites.
9. The compound according to any one of claims 1 to 5 for use in the diagnostics of a disorder or abnormality associated with alpha-synuclein aggregates including, but not limited to, Lewy bodies and/or Lewy neurites or a preclinical state thereof.
10. An *in vitro* method of collecting data for the diagnosis of a disorder or abnormality associated with alpha-synuclein aggregates in a patient comprising:
 - (a) bringing a sample of the patient suspected to contain alpha-synuclein aggregates into contact with a compound as defined in any one of claims 1 to 5;
 - (b) allowing the compound to bind to the alpha-synuclein aggregates;
 - (c) detecting the compound bound to the alpha-synuclein aggregates; and
 - (d) optionally correlating the presence or absence of compound binding with the alpha-synuclein aggregates with the presence or absence of alpha-synuclein aggregates in the sample.

11. An *in vitro* method of collecting data for diagnosis of the preclinical state of a disorder or abnormality associated with alpha-synuclein aggregates in a patient comprising detecting the specific binding of a compound as defined in any one of claims 1 to 5 to alpha-synuclein aggregates in a sample of the patient which comprises the steps of:
- 5
- (a) bringing the sample suspected to contain the alpha-synuclein aggregates into contact with the compound as defined in any one of claims 1 to 5, which compound specifically binds to the alpha-synuclein aggregates;
 - (b) allowing the compound to bind to the alpha-synuclein aggregates to form a
 - 10 compound/(alpha-synuclein aggregate) complex;
 - (c) detecting the formation of the compound/(alpha-synuclein aggregate) complex;
 - (d) optionally correlating the presence or absence of the compound/(alpha-synuclein aggregate) complex with the presence or absence of alpha-synuclein aggregates in the sample; and
 - 15 (e) optionally comparing the amount of the compound/(alpha-synuclein aggregate) complex to a normal control value.
12. An *in vitro* method of collecting data for monitoring residual disorder in a patient suffering from a disorder or abnormality associated with alpha-synuclein aggregates who has been
- 20 treated with a medicament, wherein the method comprises:
- (a) bringing a sample suspected to contain alpha-synuclein aggregates into contact with a compound as defined in any one of claims 1 to 5, which compound specifically binds to the alpha-synuclein aggregates;
 - (b) allowing the compound to bind to the alpha-synuclein aggregates to form a
 - 25 compound/(alpha-synuclein aggregate) complex;
 - (c) detecting the formation of the compound/(alpha-synuclein aggregate) complex;
 - (d) optionally correlating the presence or absence of the compound/(alpha-synuclein aggregate) complex with the presence or absence of alpha-synuclein aggregate in the sample; and
 - 30 (e) optionally comparing the amount of the compound/(alpha-synuclein aggregate) complex to a normal control value.
13. The method according to claim 12, wherein step (d) is present and wherein the method further comprises steps (i) to (vi) before step (a):

- (i) bringing a sample suspected to contain alpha-synuclein aggregates into contact with the compound as defined in any one of claims 1 to 5, which compound specifically binds to the alpha-synuclein aggregates;
- (ii) allowing the compound to bind to the alpha-synuclein aggregates to form a compound/(alpha-synuclein aggregate) complex;
- (iii) detecting the formation of the compound/(alpha-synuclein aggregate) complex;
- (iv) correlating the presence or absence of the compound/(alpha-synuclein aggregate) complex with the presence or absence of alpha-synuclein aggregates in the sample;
- (v) optionally comparing the amount of the compound/(alpha-synuclein aggregate) complex to a normal control value; and
- (vi) wherein the patient is to be treated with the medicament;
- and wherein the method further comprises step (A) after step (d) or step (e):
- (A) comparing the amount of the compound/(alpha-synuclein aggregate) complex determined in step (iv) to the amount of the compound/(alpha-synuclein aggregate) complex determined in step (d).
14. The method according to claim 12 or 13, wherein steps (a) to (c) and optionally steps (d) and (e) are repeated one or more times.
15. An *in vitro* method of collecting data for predicting responsiveness of a patient suffering from a disorder or abnormality associated with alpha-synuclein aggregates and being treated with a medicament comprising:
- (a) bringing a sample suspected to contain alpha-synuclein aggregates into contact with a compound as defined in any one of claims 1 to 5, which compound specifically binds to the alpha-synuclein aggregates;
- (b) allowing the compound to bind to the alpha-synuclein aggregates to form a compound/(alpha-synuclein aggregate) complex;
- (c) detecting the formation of the compound/(alpha-synuclein aggregate) complex;
- (d) optionally correlating the presence or absence of the compound/(alpha-synuclein aggregate) complex with the presence or absence of alpha-synuclein aggregates in the sample; and
- (e) optionally comparing the amount of the compound/(alpha-synuclein aggregate) complex to a normal control value.

16. The method according to claim 15, wherein step (d) is present and wherein the method further comprises steps (i) to (vi) before step (a):
- (i) bringing a sample suspected to contain alpha-synuclein aggregates into contact with the compound as defined in any one of claims 1 to 5, which compound specifically binds to the alpha-synuclein aggregates;
 - (ii) allowing the compound to bind to the alpha-synuclein aggregates to form a compound/(alpha-synuclein aggregate) complex;
 - (iii) detecting the formation of the compound/(alpha-synuclein aggregate) complex;
 - (iv) correlating the presence or absence of the compound/(alpha-synuclein aggregate) complex with the presence or absence of alpha-synuclein aggregates in the sample;
 - (v) optionally comparing the amount of the compound/(alpha-synuclein aggregate) complex to a normal control value; and
 - (vi) wherein the patient is to be treated with the medicament;
- and wherein the method further comprises step (A) after step (d) or step (e):
- (A) comparing the amount of the compound/(alpha-synuclein aggregate) complex determined in step (iv) to the amount of the compound/(alpha-synuclein aggregate) complex determined in step (d).
17. The method according to claim 15 or 16, wherein steps (a) to (c) and optionally steps (d) and (e) are repeated one or more times.
18. The method according to any one of claims 10 to 17, or a compound for use according to claim 9, wherein the disorder is selected from Parkinson's disease (including sporadic, familial with alpha-synuclein mutations, familial with mutations other than alpha-synuclein, pure autonomic failure or Lewy body dysphagia), dementia with Lewy bodies (including "pure" Lewy body dementia), sporadic Alzheimer's disease, familial Alzheimer's disease with APP mutations, familial Alzheimer's disease with PS-1, PS-2 or other mutations, familial British dementia, Lewy body variant of Alzheimer's disease, Down syndrome, multiple system atrophy (including Shy-Drager syndrome, striatonigral degeneration or olivopontocerebellar atrophy), traumatic brain injury, chronic traumatic encephalopathy, motor neuron disease, neuroaxonal dystrophy, neurodegeneration with brain iron accumulation type 1 (including Hallervorden-Spatz syndrome), prion diseases, ataxia telangiectatica, Meige's syndrome, subacute sclerosing panencephalitis, Gaucher disease,

lysosomal storage disorders (including Kufor-Rakeb syndrome and Sanfilippo syndrome) and rapid eye movement (REM) sleep behavior disorder.

19. The method according to any one of claims 10 to 17, or a compound for use according to claim 9, wherein the disorder is Parkinson's disease, dementia with Lewy bodies, or multiple system atrophy.

20. An *in vitro* method of determining the amount of alpha-synuclein aggregates in a sample obtained from a patient comprising:

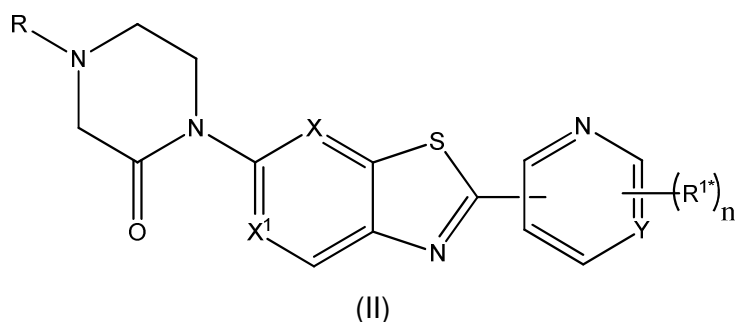
- (a) testing the sample for the presence of alpha-synuclein aggregates with a compound as defined in any one of claims 1 to 5;
- (b) determining the amount of compound bound to the alpha-synuclein aggregates; and
- (c) calculating the amount of alpha-synuclein aggregates in the sample.

21. The method according to any one of claims 10 to 20, wherein the sample is a tissue and/or a body fluid representative of a specific body part or a body area under investigation.

22. The method according to any one of claims 10 to 21, wherein alpha-synuclein aggregates include Lewy bodies and/or Lewy neurites.

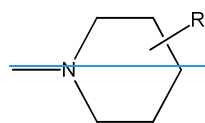
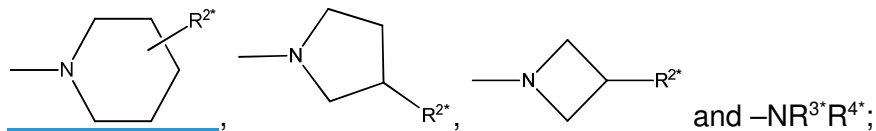
23. A mixture comprising a compound as defined in any one of claims 1 to 5 and at least one compound selected from an imaging agent different from the compound as defined in any one of claims 1 to 5, preferably an abeta or Tau imaging agent, a pharmaceutically acceptable carrier, a diluent and an excipient.

24. A compound of formula (II)



wherein **R**, **X**, **X**¹, **Y** and **n** are as defined in claim 1;

R^{1*} is independently selected from the group consisting of **LG**,



wherein

R^{2*} is selected from the group consisting of **LG** and hydrogen;

R^{3*} and **R**^{4*} are independently selected from the group consisting of alkyl, **LG**-alkyl, alkyl-O-alkyl, **PG** and hydrogen;

LG is a leaving group; and

PG is an amino protecting group,

wherein at least one of **R**^{1*}, **R**^{2*}, **R**^{3*} and **R**^{4*} contains **LG**, and

20 wherein **LG** is selected from halogen, trimethylammonium, C₁₋₄ alkyl sulfonate or C₆₋₁₀ aryl sulfonate, preferably **LG** is selected from the group consisting of mesylate, triflate, tosylate and nosylate.

25 25. A method for preparing the compound according to claim 51, wherein the compound is labelled by ¹⁸F, comprising reacting the compound according to claim 41-24 with a ¹⁸F-fluorinating agent, so that **LG** is replaced by ¹⁸F, preferably wherein the ¹⁸F-fluorinating agent is selected from K¹⁸F, H¹⁸F, Cs¹⁸F, Na¹⁸F and tetrabutylammonium [¹⁸F]fluoride.

30 26. Use of the compound according to any one of claims 1 to 5 as an *in vitro* analytical reference or an *in vitro* screening tool.

- 5
27. A test kit for use in the detection and/or diagnosis of a disorder or abnormality associated with alpha-synuclein aggregates including, but not limited to, Lewy bodies and/or Lewy neurites, wherein the test kit comprises at least one compound as defined in any one of claims 1 to 5.
28. A kit for preparing a radiopharmaceutical preparation, wherein the kit comprises a sealed vial containing at least one compound as defined in claim 24.