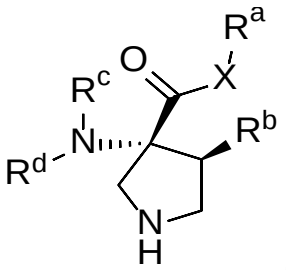
CLAIMS

1. An amine compound represented by formula I:



(I)

wherein:

X is O, S, or NR^e;

R^a is H, lower alkyl, or lower cycloalkyl;

R^b is $–CH_2CH=CH_2$, $–CH_2CH_2CH_2Z^1$, $–(CH_2)_nC(O)H$, or $–(CH_2)_nCO_2Z^2$;

R^c and R^d are independently H, lower alkyl, lower cycloalkyl, silyl, acyl, acyloxy; or R^c and R^d, together with the N that links them, form an optionally substituted 3- to 6-membered heteroaryl or heterocyclic ring;

R^e is H or lower alkyl;

n is 1 or 2;

Z^1 is halogen, alkyl sulfonate, aryl sulfonate, or an alkyl sulfonate optionally substituted with one or more halogen; and

Z^2 is H, lower alkyl, or lower cycloalkyl;

wherein the amine compound has an enantiomeric excess of greater than 75% ee.

2. The amine compound of claim 1, wherein R^a is *tert*-butyl.

3. The amine compound of claim 1, wherein R^b is $–CH_2CH=CH_2$.

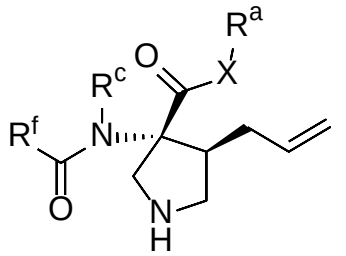
4. The amine compound of claim 1, wherein R^c is H.

5. The amine compound of claim 1, wherein R^d is acetyl or trifluoroacetyl.

6. The amine compound of claim 1, wherein X is NH.

7. The amine compound of claim 1, wherein X is O.

8. The amine compound of claim 1, wherein the amine compound is:

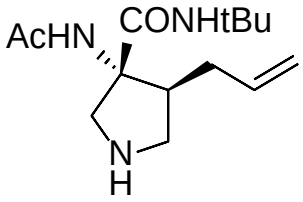


,

wherein R^f is H, lower alkyl, or lower cycloalkyl.

9. The amine compound of claim 1, wherein the amine compound has an enantiomeric excess of between 90% and 99.5% ee.

10. The amine compound of claim 1, wherein the amine compound is:



.

11. The amine compound of claim 1, wherein the amine compound has an enantiomeric excess of greater than 97% ee.

12. The amine compound of claim 8, wherein the amine compound has an enantiomeric excess of between 90% and 99.5% ee.

13. The amine compound of claim 8, wherein the amine compound has an enantiomeric excess of greater than 97% ee.

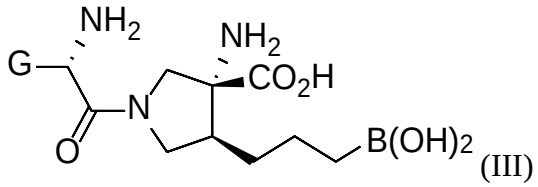
14. The amine compound of claim 8, wherein the amine compound has an enantiomeric excess of greater than 99% ee.

15. The amine compound of claim 10, wherein the amine compound has an enantiomeric excess of between 90% and 99.5% ee.

16. The amine compound of claim 10, wherein the amine compound has an enantiomeric excess of greater than 97% ee.

17. The amine compound of claim 10, wherein the amine compound has an enantiomeric excess of greater than 99% ee.

18. A process that uses the amine compound of claim 10 to prepare an arginase inhibitor of formula III:

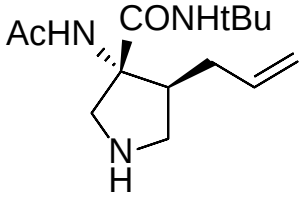


(III)

wherein G is H, methyl, isopropyl, *sec*-butyl, $-CH_2CH(CH_3)_2$, benzyl, p-hydroxybenzyl, $-CH_2OH$, $-CH(OH)CH_3$, $-CH_2$-3-indoyl, $-CH_2COOH$, $-CH_2CH_2COOH$, $-CH_2C(O)NH_2$, $-CH_2CH_2C(O)NH_2$, $-CH_2SH$, $-CH_2CH_2SCH_3$, $-(CH_2)_4NH_2$, $-(CH_2)_3NHC(=NH)NH_2$, or $-CH_2$-3-imidazoyl;

said process comprising:

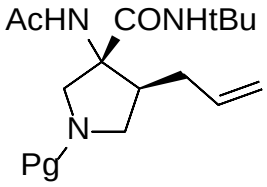
(a) providing the amine compound of claim 10:



,

wherein the amine compound has an enantiomeric excess greater than 80% ee;

(b) adding a protecting group to the secondary amine of the amine compound provided in step (a) to form the following compound:



,

wherein the protecting group (Pg) is formyl, acetyl, trifluoroacetyl, benzyl, benzyloxycarbonyl, *tert*-butoxycarbonyl, trimethylsilyl, 2-trimethylsilyl-ethanesulfonyl, methoxymethyl, triethylsilyl, triisopropylsilyl, *tert*-butyldimethylsilyltrityl, trityl, allyloxycarbonyl, 9-fluorenylmethyloxycarbonyl, or nitro-veratryloxycarbonyl;

(c) subjecting the compound prepared by step (b) to hydroboration conditions;

(d) removing the secondary amine protecting group from the compound prepared by step (c);

(e) subjecting the secondary amine of the compound prepared by step (d) to an amidation reaction; and

(f) subjecting the compound prepared by step (e) to conditions sufficient to form the compound of formula III;

wherein the compound of formula III prepared by the process has an enantiomeric excess of greater than 80% ee.

19. The process of claim 18, wherein the amine compound provided in step (a) has an enantiomeric excess greater than 90% ee.

20. The process of claim 18, wherein the compound of formula III prepared by the process has an enantiomeric excess of greater than 90% ee.