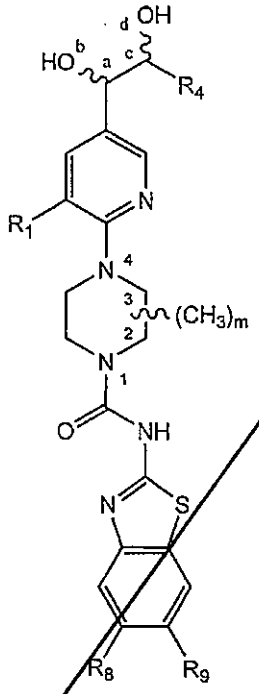
WHAT IS CLAIMED:

1. A compound of formula (I):



(I)

or a pharmaceutically acceptable derivative thereof, wherein:

R_1 is -halo or $-CF_3$;

R_4 is -H or $-CH_3$;

each R_8 and R_9 is independently -H, -halo, $-CH_3$, $-CF_3$, $-OCH_3$, $-OCF_3$, $-OCH_2CH_3$, $-CH_2OCH_3$, or $-C(O)OR_{10}$;

R_{10} is $-(C_1\text{-}C_4)$alkyl;

each halo is independently -F, -Cl, -Br, or -I; and

m is the integer 0 or 1;

(1) provided that if R_4 is -H then m is 1; and

(2) provided that if R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*S*) configuration, then the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group, a (*S*)-3-methyl group, or a (*R*)-3-methyl group.

2. The compound of claim 1 or a pharmaceutically acceptable derivative thereof, wherein it is further provided that:

(3) if R_4 is -H, the carbon atom at the a position of the a-b bond is in the (*S*) configuration, R_8 is -H, and R_9 is -halo, then the methyl group bonded to the piperazine ring is a (*R*)-3-methyl group;

(4) if R_4 is -H, the carbon atom at the a position of the a-b bond is in the (*S*) configuration, R_8 is -F, and R_9 is -F, then the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group or a (*S*)-3-methyl group; and

(5) if R_4 is $-CH_3$, the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*S*) configuration, R_8 is -H, R_9 is -halo, and m is 1, then the methyl group bonded to the piperazine ring is a (*S*)-3-methyl group or a (*R*)-3-methyl group.

3. The compound of claims 1 or 2 or a pharmaceutically acceptable derivative thereof, wherein R_1 is -F, -Cl, or $-CF_3$ and preferably is –F.

4. The compound of any one of claims 1-3 or a pharmaceutically acceptable derivative thereof, wherein R_{10} is $-CH_3$ or $-CH_2CH_3$ and preferably is $-CH_2CH_3$.

5. The compound of any one of claims 1-4 or a pharmaceutically acceptable derivative thereof, wherein R_9 is -H, -F, -Cl, -Br, $-CH_3$, $-CF_3$, $-OCH_3$, $-OCF_3$, $-OCH_2CH_3$, $-CH_2OCH_3$, or $-C(O)OCH_2CH_3$ and preferably is -H.

6. The compound of any one of claims 1-5 or a pharmaceutically acceptable derivative thereof, wherein R_8 is -H, -F, or $-CH_3$, and preferably is -F or $-CH_3$.

7. The compound of any one of claims 1-6 or a pharmaceutically acceptable derivative thereof, wherein

(i) R_4 is $-CH_3$ and the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*S*) configuration; or

(ii) R_4 is $-CH_3$ and the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*R*) configuration; or

(iii) R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*S*) configuration or

(iv) R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*R*) configuration.

8. The compound of any one of claims 1-7 or a pharmaceutically acceptable derivative thereof, wherein m is 1 and the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group.

9. The compound of any one of claims 1-8, wherein the pharmaceutically acceptable derivative is a pharmaceutically acceptable salt, radiolabeled form, a co-crystal, or a combination thereof, and wherein preferably

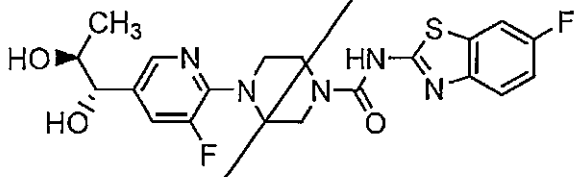
(i) the pharmaceutically acceptable derivative is a pharmaceutically acceptable salt, radiolabeled form, or a hydrochlorate, tartrate, benzenesulfonate, *p*-toluenesulfonate, or fumarate co-crystal, and more preferably, the pharmaceutically acceptable derivative is a hydrochloride salt, a sodium salt, a potassium salt, a *p*-toluenesulfonic acid salt, a fumaric acid-salt, or a fumarate co-crystal; or

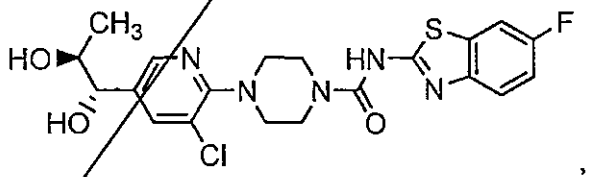
(ii) the pharmaceutically acceptable derivative is a fumaric acid-salt, a fumarate co-crystal, or a combination thereof.

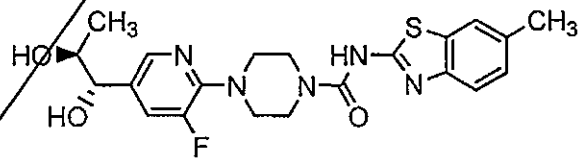
The compound of claim 7 option (i) or (ii) or a pharmaceutically acceptable derivative thereof, wherein m is 0.

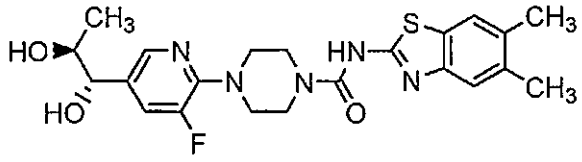
11. The compound of claim 10 wherein the pharmaceutically acceptable derivative is a pharmaceutically acceptable salt, radiolabeled form, or a hydrochlorate, tartrate, benzenesulfonate, *p*-toluenesulfonate, or fumarate co-crystal, and preferably, is a fumaric acid-salt, a fumarate co-crystal, or a combination thereof.

12. The compound of claim 10 or a pharmaceutically acceptable derivative thereof, which is

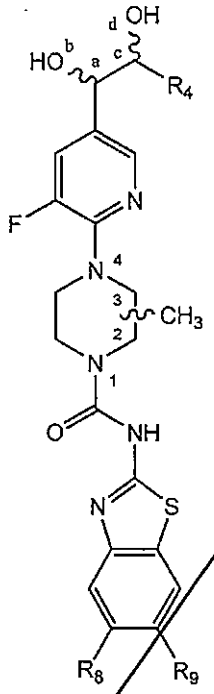

,


,


, or


.

13. A compound of formula (II):



(II)

or a pharmaceutically acceptable derivative thereof, wherein:

R_4 is -H or $-CH_3$;

R_8 is -H, -F, or $-CH_3$;

R_9 is -H, -halo, $-CH_3$, $-CF_3$, $-OCH_3$, $-OCF_3$, $-OCH_2CH_3$, $-CH_2OCH_3$, or $-C(O)OCH_2CH_3$; and each halo is independently -F, -Cl, -Br, or -I;

(1) provided that if R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*S*) configuration, then the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group, a (*S*)-3-methyl group, or a (*R*)-3-methyl group.

14. The compound of claim 13 or a pharmaceutically acceptable derivative thereof, wherein it is further provided that:

(2) if R_4 is -H, the carbon atom at the a position of the a-b bond is in the (*S*) configuration, R_8 is -H, and R_9 is -halo, then the methyl group bonded to the piperazine ring is a (*R*)-3-methyl group;

(3) if R_4 is -H, the carbon atom at the a position of the a-b bond is in the (*S*) configuration, R_8 is -F, and R_9 is -F, then the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group or a (*S*)-3-methyl group; and

(4) if R_4 is $-CH_3$, the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*S*) configuration, R_8 is -H, and R_9 is -halo, then the methyl group bonded to the piperazine ring is a (*S*)-3-methyl group or a (*R*)-3-methyl group.

15. The compound of claim 13 or a pharmaceutically acceptable derivative thereof, wherein

(i) R_4 is $-CH_3$ and the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*S*) configuration or

(ii) R_4 is $-CH_3$ and the carbon atoms at the a and c positions of the a-b bond and the c-d bond are each in the (*R*) configuration.

16. The compound of claim 13 or claim 14 or a pharmaceutically acceptable derivative thereof, wherein R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*S*) configuration.

17. The compound of claim 13 or a pharmaceutically acceptable derivative thereof, wherein R_4 is -H and the carbon atom at the a position of the a-b bond is in the (*R*) configuration.

18. The compound of any one of claims 13-17 or a pharmaceutically acceptable derivative thereof, wherein the methyl group bonded to the piperazine ring is

(i) a (*S*)-3-methyl group,

(ii) a (*S*)-2-methyl group, or

(iii) a (*R*)-3-methyl group.

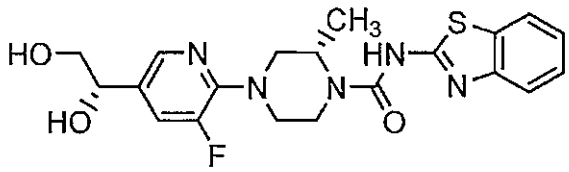
19. The compound of any one of claims 13-18 or a pharmaceutically acceptable derivative thereof, wherein R_9 is –H and/or R_8 is -F.

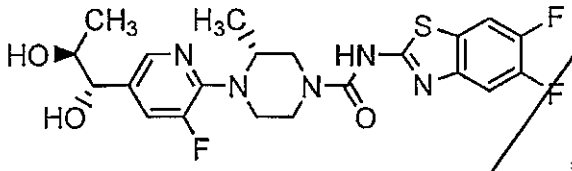
20. The compound of any one of claims 13-19, wherein the pharmaceutically acceptable derivative is

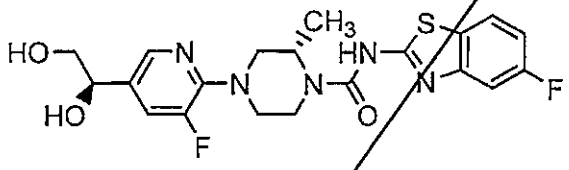
(i) a pharmaceutically acceptable salt, or a fumarate co-crystal, and preferably a hydrochloride salt, a sodium salt, a potassium salt, a *p*-toluenesulfonic acid salt, a fumaric acid-salt, or a fumarate co-crystal; or

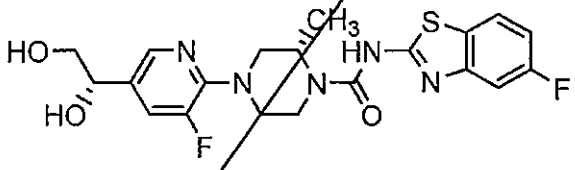
(ii) a fumaric acid-salt, a fumarate co-crystal, or a combination thereof.

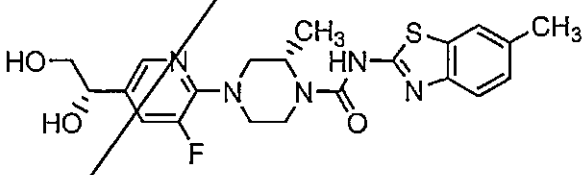
21. The compound of claim 13 or a pharmaceutically acceptable derivative thereof, which is

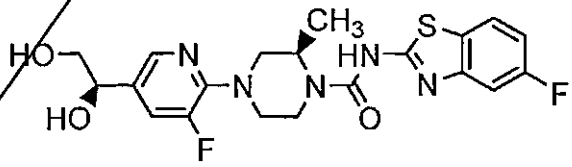

,

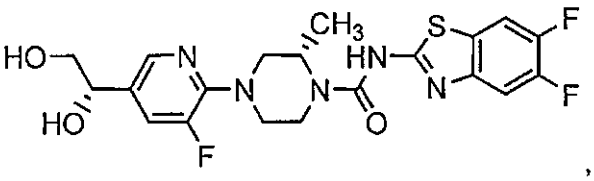

,

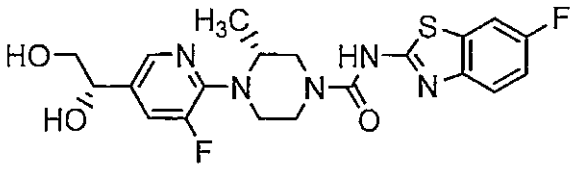

,


,


,


,


, or

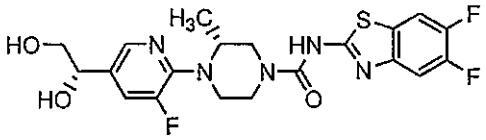
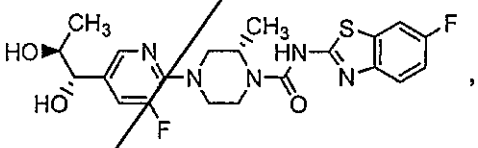


22. The compound of any one of claims 10, 12 or 21, which is

(i) a fumaric acid-salt, a fumarate co-crystal, or a combination thereof, or

(ii) a free base.

23. A compound which is


,

,

or a pharmaceutically acceptable derivative thereof.

24. A composition comprising the compound of any one of claims 1-23 or a pharmaceutically acceptable derivative thereof and a pharmaceutically acceptable carrier or excipient.

25. Use of a compound of any one of claims 1-23 or a pharmaceutically acceptable derivative thereof in the manufacture of a medicament for the treatment of pain, pain associated with osteoarthritis, osteoarthritis, UI, an ulcer, IBD, or IBS.

26. A method of inhibiting TRPV1 function in a cell comprising contacting a cell capable of expressing TRPV1 with an effective amount of the compound of any one of claims 1-23 or a pharmaceutically acceptable derivative thereof.

27. The product of combining the compound of any one of claims 1-17, 18 option (i) and (iii) or 19-21 with fumaric acid, wherein the molar ratio in the product is about 1:0.5 of (the Compound of Formula (I) or (II)):(fumaric acid).

28. A composition comprising the product of claim 27 and a pharmaceutically acceptable carrier or excipient.

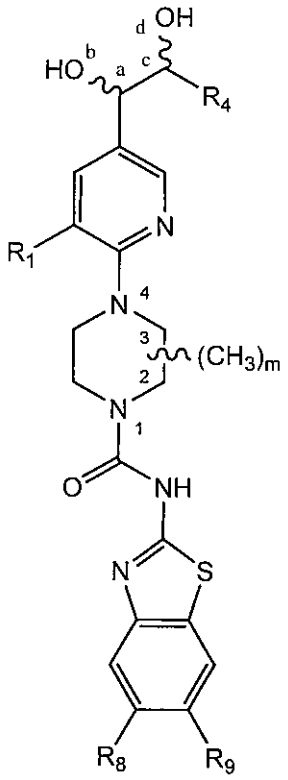
29. Use of a product or a composition of claims 27 or a pharmaceutically acceptable derivative thereof in the manufacture of a medicament for the treatment of pain, pain associated with osteoarthritis, osteoarthritis, UI, an ulcer, IBD, or IBS.

30. A method of inhibiting TRPV1 function in a cell comprising contacting a cell capable of expressing TRPV1 with an effective amount of the product of claim 27.

31. The compound, product, or composition of any one of claims 1-30 or a pharmaceutically acceptable derivative thereof, wherein the % *ee* of the compound is at least about 90%, and preferably is at least about 93%.

WHAT IS CLAIMED:

1. A compound of formula (I):



(I)

or a pharmaceutically acceptable derivative thereof, wherein:

R_1 is -halo;

R_4 is -H;

each R_8 and R_9 is independently -H, -halo, $-CH_3$, or $-CF_3$;

each halo is independently -F, -Cl, -Br, or -I; and

m is the integer 1;

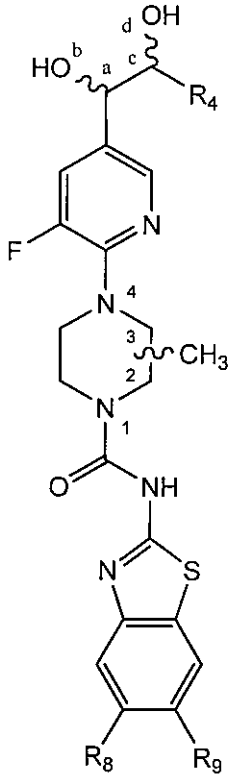
wherein the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group; and the carbon atom at the a position of the a-b bond is in the (*S*) configuration;

wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

2. The compound of claim 1 wherein the pharmaceutically acceptable derivative is a pharmaceutically acceptable salt, radiolabeled form, or a hydrochloric acid, tartaric acid, benzenesulfonic acid, *p*-toluenesulfonic acid, or fumaric acid co-crystal.

3. The compound of claim 2, wherein the pharmaceutically acceptable derivative is a fumaric acid-salt, a fumaric acid co-crystal, or a combination thereof.

4. A compound of claim 1 having formula (II):



(II)

or a pharmaceutically acceptable derivative thereof, wherein:

R_4 is -H;

R_8 is -H, -F, or $-CH_3$;

R_9 is -H, -halo, $-CH_3$, or $-CF_3$; and

each halo is independently -F, -Cl, -Br, or -I;

wherein the methyl group bonded to the piperazine ring is a (*S*)-2-methyl group; and the carbon atom at the a position of the a-b bond is in the (*S*) configuration;

and wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

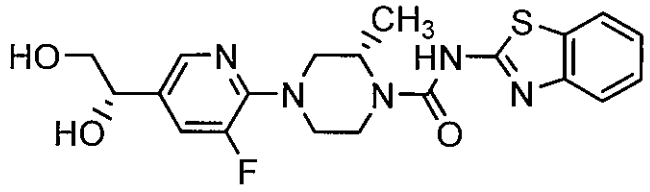
5. The compound of claim 4, wherein the pharmaceutically acceptable derivative is

(i) a pharmaceutically acceptable salt, or a fumaric acid co-crystal; or

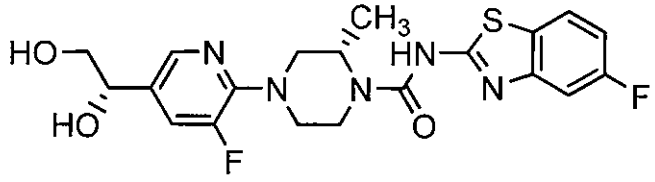
(ii) a fumaric acid-salt, a fumaric acid co-crystal, or a combination thereof.

6. The compound of claim 5 option (i), wherein the pharmaceutically acceptable derivative is a hydrochloride salt, a sodium salt, a potassium salt, a *p*-toluenesulfonic acid salt, a fumaric acid-salt, or a fumaric acid co-crystal.

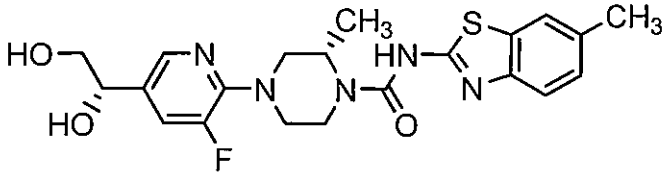
7. The compound of claim 4 or a pharmaceutically acceptable derivative thereof, which is



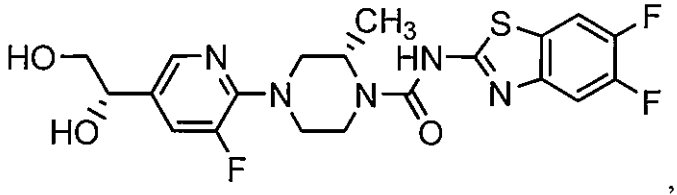
,



,



, or



,

wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

8. The compound of any one of claims 1 or 7, which is

(i) a fumaric acid-salt, a fumaric acid co-crystal, or a combination thereof, or

(ii) a free base.

9. A compound of any one of claims 1-8 or a pharmaceutically acceptable derivative thereof for use in the treatment of pain, pain associated with osteoarthritis, osteoarthritis, UI, an ulcer, IBD, or IBS, wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

10. The product of combining the compound of any one of claims 1-8 with fumaric acid, wherein the molar ratio in the product is about 1:0.5 of (the Compound of Formula (I) or (II)):(fumaric acid).

11. A composition comprising

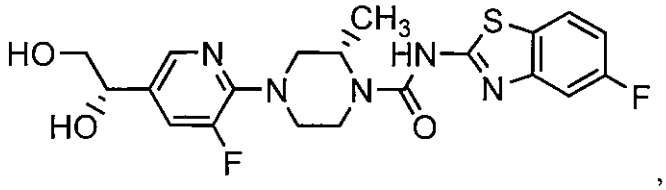
(i) the compound of any one of claims 1-8 or a pharmaceutically acceptable derivative thereof; or

(ii) the product of claim 10;

and a pharmaceutically acceptable carrier or excipient, wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

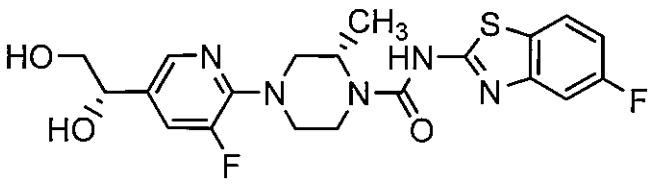
12. A product of claim 10 or a pharmaceutically acceptable derivative thereof for use in the treatment of pain, pain associated with osteoarthritis, osteoarthritis, UI, an ulcer, IBD, or IBS, wherein the pharmaceutically acceptable derivative is selected from the group consisting of a pharmaceutically acceptable salt, polymorph, pseudopolymorph, solvate, co-crystal, radiolabeled form, and/or tautomer.

13. A compound of claim 4 having the structure:



or a fumaric acid co-crystal thereof.

14. The compound of claim 13 in the form of a co-crystal of combining the compound



with fumaric acid, wherein the molar ratio in the co-crystal is about 1:0.5 of (the Compound):(fumaric acid).

15. A fumaric acid co-crystal of claim 13 or claim 14 having an x-ray powder diffraction pattern comprising a peak at each of 6.5°± 0.2°, 12.5°± 0.2°, 16.8°± 0.2°, and 25.3°± 0.2°.

16. A fumaric acid co-crystal of claim 13 or claim 14 having an x-ray powder diffraction pattern comprising a peak at each of 6.5°± 0.2°, 8.6°± 0.2°, 12.5°± 0.2°, 14.0°± 0.2°, 16.8°± 0.2°, 18.7°± 0.2°, and 25.3°± 0.2°.

17. A fumaric acid co-crystal of claim 13 or claim 14 having an x-ray powder diffraction pattern comprising a peak at each of 6.5°± 0.2°, 8.6°± 0.2°, 12.5°± 0.2°, 14.0°± 0.2°, 16.8°± 0.2°, 18.7°± 0.2°, 20.4°± 0.2°, 21.3°± 0.2°, 22.0°± 0.2°, 23.2°± 0.2°, 25.3°± 0.2°, and 38.5°± 0.2°.