What is claimed is：

1. A bulk acoustic resonator, comprising: a substrate, wherein the substrate comprises a first semiconductor layer, an insulating layer and a second semiconductor layer, which are stacked in sequence; the surface of the second semiconductor layer is etched to form a groove, and the groove penetrates through the second semiconductor layer; and a protection part is formed in the groove, and a vertical section of the groove has a smooth contour; wherein a notch of the groove has an inclined section, and an inclination angle of the inclined section is not greater than 10°.

2. The bulk acoustic resonator according to claim 1, wherein in a longitudinal direction of the second semiconductor layer, a width of the vertical section of the groove changes from large to small.

3. The bulk acoustic resonator according to claim 1, wherein a contour of the vertical section of the groove comprises a trapezoid.

4. The bulk acoustic resonator according to claim 1, wherein a vertical height of the inclined section is not greater than two thirds of a height of the second semiconductor layer.

5. A preparation method of a bulk acoustic resonator, wherein the method comprises:

providing a substrate, wherein the substrate comprises a first semiconductor layer, an insulating layer and a second semiconductor layer, which are stacked in sequence;

forming an annular groove in the substrate, wherein the annular groove penetrates through the second semiconductor layer;

forming an oxide layer on a surface of the substrate, and filling the annular groove with the oxide layer, so as to form a protection part in the annular groove;

sequentially forming a bottom electrode, a piezoelectric layer and a top electrode on one side surface of the second semiconductor layer that faces away from the insulating layer; and

releasing the second semiconductor layer located in the protection part, so as to form a cavity.

6. The method according to claim 5, wherein,

a vertical section of the annular groove is rectangular; and forming the oxide layer on the surface of the substrate, and filling the annular groove with the oxide layer, so as to form the protection part in the annular groove, comprises:

performing an oxidation treatment on the surface of the second semiconductor layer, so that a portion of the second semiconductor layer is converted into a first oxide layer;

removing the first oxide layer, so that a width of the vertical section of the annular groove changes from large to small in a longitudinal direction of the second semiconductor layer;

forming a second oxide layer on one side surface of the second semiconductor layer that faces away from the first semiconductor layer, and filling the annular groove with the second oxide layer; and

removing the second oxide layer from the side surface of the second semiconductor layer that faces away from the first semiconductor layer, and retaining the second oxide layer in the annular groove, so as to form the protection part.

7. The method according to claim 5, wherein,

in a longitudinal direction of the second semiconductor layer, a width of the vertical section of the annular groove changes from large to small; and

forming the oxide layer on the surface of the substrate, and filling the annular groove with the oxide layer, so as to form the protection part in the annular groove, comprises:

forming a third oxide layer on one side surface of the second semiconductor layer that faces away from the first semiconductor layer, and filling the annular groove with the third oxide layer; and

removing the third oxide layer from the side surface of the second semiconductor layer that faces away from the first semiconductor layer, and retaining the third oxide layer in the annular groove, so as to form the protection part.

8. The method according to claim 5, wherein,

the vertical section of the annular groove is rectangular or tends to be rectangular; and

forming the oxide layer on the surface of the substrate, and filling the annular groove with the oxide layer, so as to form the protection part in the annular groove, comprises:

forming a fourth oxide layer on one side surface of the second semiconductor layer that faces away from the first semiconductor layer, and bombarding the fourth oxide layer for the first time, so as to remove the fourth oxide layer located at a notch of the annular groove, wherein the fourth oxide layer fills a portion of the annular groove;

forming a fifth oxide layer on one side surface of the fourth oxide layer that faces away from the substrate, and bombarding the fifth oxide layer for the second time, so as to remove the fifth oxide layer located at the notch of the annular groove, wherein the fifth oxide layer fills a portion of the annular groove; and by means of analogy in sequence, until the oxide layer completely fills the annular groove, so as to form the protection part.

9. A filter, comprising the bulk acoustic resonator according to claim 1.

10. The filter according to claim 9, wherein in a longitudinal direction of the second semiconductor layer, a width of the vertical section of the groove changes from large to small.

11. The filter according to claim 9, wherein a contour of the vertical section of the groove comprises a trapezoid.

12. The filter according to claim 9, wherein a notch of the groove has an inclined section, and an inclination angle of the inclined section is not greater than 10°.

13. The filter according to claim 12, wherein a vertical height of the inclined section is not greater than two thirds of a height of the second semiconductor layer.