CLAIMS

What is claimed is:

1. An isolation device for isolation of target particles from a liquid sample, characterized in that, the isolation device comprises:

an isolation chip comprising:

a sample reservoir;

at least one first chamber disposed on a side of the sample reservoir; and

at least one second chamber disposed on another side of the sample reservoir away from the at least one first chamber; wherein two adjacent first chambers are connected through a first filtration membrane, one of the at least one first chamber closest to the sample reservoir is connected to the sample reservoir through another first filtration membrane, two adjacent second chambers are connected through a second filtration membrane, one of the at least one second chamber closest to the sample reservoir is connected to the sample reservoir through another second filtration membrane, each of an average pore size of the first filtration membrane and an average pore size of each second filtration membrane is smaller than a size of the target particles;

an oscillation system comprising:

a pressing assembly; and

two ultrasonic generators disposed on the pressing assembly, wherein the pressing assembly is configured to drive the two ultrasonic generators to move towards the isolation chip to

make in contact with an outer surface of an outermost one of the at least one first chamber and an outer surface of an outermost one of the at least one second chamber, the pressing assembly comprises a base, a moving mechanism, and a driving mechanism, the moving mechanism is sleeved on a driving shaft of the driving mechanism, the moving mechanism comprises a first slide rail disposed on the base, two first sliders disposed sliding on the first slide rail, a first mounting plate disposed on each first slide rail, a second slide rail disposed on each first mounting plate, a second slide rail disposed sliding on each second slide rail, a second mounting plate disposed on each second slide rail, and two elastic member, one ultrasonic generator is disposed on one second mounting plate, two ends of each elastic member are connected to one first mounting plate and one corresponding second mounting plate;

a differential pressure driving system;

a frequency conversion module connected to the outermost one of the at least one first chamber and the outermost one of the at least one second chamber through the differential pressure driving system, the frequency conversion module is configured to control the differential pressure driving system to generate differential pressure in the at least one first chamber and the at least one second chamber alternately; and

a controller configured to control the two ultrasonic generators to vibrate to generate two ultrasonic waves when the differential pressure driving system stops to generate differential pressure in the at least one first chamber or the at least one second chamber.

2. The isolation device of claim 1, characterized in that, a frequency of each of the two ultrasonic

waves is 15 KHz to 80 KHz;

within a period of each of the two ultrasonic waves, a duty cycle of each of the two ultrasonic waves is 10% to 90%.

3. The isolation device of claim 2, characterized in that, a ratio of change between two frequencies of the two ultrasonic waves is less than or equal to 30%, and a ratio of change between two duty cycles of the two ultrasonic waves is less than or equal to 30%.

4. The isolation device of claim 1, characterized in that, the controller is configured to power the two ultrasonic generators on and off, within a period of the power on and power off, a ratio of the power on is 10% to 100%.

5. The isolation device of claim 1, characterized in that, the two ultrasonic generators are located on a same horizontal plane.

6. The isolation device of claim 1, characterized in that, each of the two ultrasonic generators comprises a horn close to the isolation chip and a piezoelectric ceramic unit connected to the horn.

7. The isolation device of claim 6, characterized in that, the horn comprises a first horn portion, a second horn portion, a third horn portion, and a connecting portion connected with each other in that order, the connecting portion away from the third horn portion is connected to the piezoelectric ceramic unit, an end surface of the first horn portion away from the second horn portion is configured to make in contact with the outer surface of the outermost one of the at least one first chamber or the outer surface of the outermost one of the at least one second chamber, wherein along a direction perpendicular to an extension direction of the horn, a size of the second horn portion is respectively

smaller than a size of the first horn portion and a size of the third horn portion.

8. The isolation device of claim 6, characterized in that, the piezoelectric ceramic unit comprises a plurality of piezoelectric ceramic sheets, a plurality of electrode sheets stacked with the plurality of piezoelectric ceramic sheets, an insulating sleeve, and a connector, the plurality of piezoelectric ceramic sheets are disposed alternately with the plurality of electrode sheets, the plurality of piezoelectric ceramic sheets and the plurality of electrode sheets are sleeved on the insulating sleeve, the connector penetrates through the insulating sleeve to detachably connect to the horn.

9. The isolation device of claim, characterized in that, each of the two ultrasonic generators further comprises an adjusting block disposed on the piezoelectric ceramic unit away from the horn, the connector is further connected to the adjusting block.

10. An isolation method for isolation and purification of target particles from a liquid sample, characterized in that, the method comprises:

providing an isolation chip of any one of claims 1 to 9, and adding a liquid sample to the sample reservoir;

controlling the pressing assembly to drive the two ultrasonic generators to move towards the isolation chip, causing end surfaces of the two ultrasonic generators close to the isolation chip to make in contact with an outer surface of the outermost one of the at least one first chamber and an outer surface of the outermost one of the at least one second chamber;

evacuating the at least one first chamber to generate a differential pressure in the at least one first chamber, causing compositions in the sample reservoir that are smaller than pores of the

corresponding first filtration membrane to pass through the corresponding first filtration membrane under the differential pressure and enter the at least one first chamber;

cancelling the differential pressure in the at least one first chamber, and controlling the two ultrasonic generators to operate to generate two ultrasonic waves;

evacuating the at least one second chamber to generate a differential pressure in the at least one second chamber, causing compositions in the sample reservoir that are smaller than pores of the corresponding second filtration membrane to pass through the corresponding second filtration membrane under the differential pressure and enter the at least one second chamber; and

cancelling the differential pressure in the at least one second chamber, and controlling the two ultrasonic generators to generate another two ultrasonic waves.