

CLAIMS:

1. An acoustophoresis system, comprising:
a chamber for receiving a fluid mixture that includes cells or particles in
a fluid;
5 an ultrasonic transducer coupled to the chamber and configured to be
excited to generate an acoustic wave in the chamber; and
a driver electrically connected to the ultrasonic transducer and
configured to provide an excitation to the ultrasonic transducer to generate the
acoustic wave in the chamber, the driver including an amplifier.
10
2. The system of claim 1, wherein at least one ultrasonic transducer
comprises a plurality of transducers, each of the plurality of transducers individually
electrically connected to its own amplifier.
- 15 3. The system of claim 1, further comprising a function generator that drives
the amplifier by generating a signal that is sent to the amplifier.
4. The system of claim 1, further comprising a capacitor electrically
connected between the amplifier and the at least one ultrasonic transducer.
20
5. The system of claim 1, further comprising a power resistor electrically
connected between the amplifier and the at least one ultrasonic transducer.
6. The system of claim 5, further comprising an oscilloscope for measuring
25 a first voltage before the power resistor and a second voltage after the power resistor.
7. The system of claim 1, further comprising a particle analyzer located
downstream of the one or more flow chamber outlets.
- 30

8. A method for controlling an acoustophoretic device that uses an ultrasonic transducer to create a multi-dimensional acoustic standing wave, the method comprising:

- driving an amplifier electrically connected to the at least one ultrasonic
- 5 transducer to send an output signal to the ultrasonic transducer;
- measuring a first voltage between the amplifier and a predetermined first impedance;
- measuring a second voltage between the first impedance and the at
- least one ultrasonic transducer;
- 10 measuring a current from the output signal between the measured first and second voltages;
- determining an actual impedance of the ultrasonic transducer from the measured current and measured first and second voltages; and
- adjusting the output signal from the amplifier to obtain a desired
- 15 impedance of the ultrasonic transducer.

9. The method of claim 8, wherein the actual impedance of the ultrasonic transducer is proportional to both the measured current and the first impedance and is inversely proportional to both the measured first and second voltages.

20

10. The method of claim 8, further comprising determining an electrical power consumed by the ultrasonic transducer from the measured second voltage and the impedance of the at least one ultrasonic transducer.

25

11. The method of claim 10, wherein the electrical power consumed by the ultrasonic transducer is proportional to the measured second voltage and is inversely proportional to the impedance of the at least one ultrasonic transducer.

30

12. The method of claim 8, wherein the amplifier is driven by a function generator that generates a low voltage sinusoidal voltage signal that is sent to the amplifier.

13. The method of claim 8, wherein the first and second voltages are measured by an oscilloscope.

14. The method of claim 8, further comprising characterizing the particles using a particle analyzer located downstream of the acoustophoretic device.

5 15. The method of claim 8, wherein the first impedance is predetermined across a power resistor electrically connected between the amplifier and the ultrasonic transducer.

10 16. The method of claim 15, wherein the predetermined first impedance across the power resistor is proportional to the first voltage and is inversely proportional to the second voltage.

17. The method of claim 8, further comprising determining the phase angle of the impedance of the ultrasonic transducer.

15 18. A system for controlling an associated acoustophoretic device, comprising:

an amplifier that produces an output signal;

a function generator that provides a signal to the amplifier;

20 a power resistor to be electrically connected between the amplifier and the associated acoustophoretic device; and

a means for measuring a first voltage before the power resistor and a second voltage after the power resistor.

25