CLAIMS

1. A device for determining a mechanical property of a particle in a fluid suspension, the device comprising:

(a) at least one inlet for introducing the fluid suspension;

(b) at least one outlet for discharging the fluid suspension;

(c) a channel in fluid communication with and intermediate the at least one inlet and the at least one outlet, the channel comprising first, second and third sections, the second section disposed intermediate the first and third portions, wherein

(i) the first section is disposed adjacent the at least one inlet, a portion of the first section is curved to form at least one curved unit;

(ii) the third section is adjacent the outlet, the third section comprises a junction wherein the channel splits to at least two divergent channels to form a T-junction that converges into a single channel extending to the at least one outlet; and

(iii) the second section comprises an electrical sensing zone;

(d) at least one electrode disposed adjacent the electrical sensing zone;

(e) an image capturing device disposed adjacent the junction to capture an image of the particle as it passes through the junction,

wherein the at least one electrode is configured to detect the presence of the particle arriving at the T-junction and, upon detection of the particle, to generate a differential current pulse to trigger a signal to the image capturing device to capture the image of the particle.

2. The device according to claim 1, wherein the first section is sinuous and comprises a plurality of curved units.

3. The device according to any one of the preceding claims, wherein the second section is substantially straight.

4. The device according to any one of the preceding claims, wherein a plurality of electrodes are disposed transverse the channel.

5. The device according to claim 4, wherein the plurality of electrodes comprises three electrodes, a first, second and third electrodes, the second electrode is disposed intermediate the first and third electrodes, each electrode is about 5-30 μm in width and the distance between each electrode is about 5-30 μm.

6. The device according to claim 5, wherein a current having an input voltage of 0.1-5 V and a frequency of 0.1-10 MHz is applied to the second electrode and a differential current is calculated across the first and third electrodes.

7. The device according to any one of the preceding claims, further comprising two inlets disposed perpendicular to and each on opposite sides of the channel intermediate the second and third sections, the two inlets in fluid communication with the channel for introducing a sheath flow to the channel for aligning the particles towards the center of the channel.

8. The device according to any one of the preceding claims, wherein the third section of the channel which splits to form at least two divergent channels that converges into a single channel forms a substantially symmetrical configuration.

9. The device according to any one of the preceding claims, wherein the third section and outlet forms an outlet section and, wherein the channel intermediate the second and third section splits to form a plurality of outlet sections.

10. A method for determining a mechanical property of a particle in a fluid suspension, the method comprising:

(a) allowing the fluid suspension to flow through a channel, the channel comprising first, second and third sections, wherein the first section comprising at least one curved unit, the second section comprising an electrical sensing zone, and the third section comprises a T-junction wherein the channel splits to form at least two divergent channels; and

(b) detecting the presence of the particle arriving at the T-junction and, upon detection of the particle, generating a differential current pulse to trigger a signal to an image capturing device to capture the image of the particle.

11. The method according to claim 10, wherein the first section is sinuous and comprises a plurality of curved units.

12. The method according to any one of claims 10 or 11, wherein the particle is suspended in a viscoelastic fluid, the method further comprising aligning the particle to the center of the channel by viscoelastic forces.

13. The method according to any one of claims 10 to 12, wherein 3 electrodes are disposed transverse the channel adjacent the electrical sensing zone to detect the presence of the particle arriving the junction, the 3 electrodes comprising a first, a second and third electrodes, the second electrode is disposed intermediate the first and third electrodes, each electrode is about 20 μm in width and the distance between each electrode is about 20 μm.

14. The method according to claim 13, further comprising applying a current having an input voltage of 0.1-10 V and frequency of 0.1-50 MHz to the second electrode and calculating a differential current across the first and third electrodes.

15. The method according to any one of claims 10 to 14, wherein when triggered, the image capturing device records a series of frames at a rate of 1,000-10,000 frames per second, with an exposure time of about 50 μs for each frame.

16. The method according to any one of claims 10 to 15, further comprising introducing a sheath flow into the channel perpendicular to and on opposite sides of the channel intermediate the second and third sections, the sheath flow for aligning the particles towards the center of the channel.

17. The method according to any one of claims 10 to 16, wherein the at least two divergent channels of the third section converges into a single channel and extends to an outlet to discharge the fluid suspension, the third section forms a substantially symmetrical configuration..

18. The method according to claim 17, wherein the third section and outlet forms an outlet section, and wherein the channel intermediate the second and third section splits to form a plurality of outlet sections allowing for a plurality of junctions for the capturing of images of particles passing through the junctions.

19. The method according to any one of claims 10 to 18, wherein the fluid is allowed to flow continuously though the channel at a flow rate of about 10 to 30 μl/min.