CLAIMS

1. A spectrometer configured to determine an identity of analyte particles in solution, the spectrometer comprising:

an electrode configured to be placed in an AC electric field;

a controller configured to switch at least one property of the AC electric field from a first condition to a second condition, wherein when the AC electric field is in the first condition, the analyte particles are trapped in a first AC kinetic trap on the electrode and wherein when the AC electric field is in the second condition, the analyte particles trapped in a second AC kinetic trap on the electrode;

a detector configured to determine at least one motion characteristic of the analyte particles from the first AC kinetic trap to the second AC kinetic trap in response to switching the at least one property of the AC electric field; and

at least one processor programmed to determine an identity of the analyte particles based, at least in part, on the determined at least one motion characteristic.

2. The spectrometer of claim 1, wherein the at least one property comprises a frequency of the AC electric field and/or an amplitude of the AC electric field.

3. The spectrometer of any of the preceding claims, wherein the first AC kinetic trap is an electroosmosis trap and the second AC kinetic trap is a dielectrophoresis trap.

4. The spectrometer of any of the preceding claims, wherein determining an identity of the analyte particles comprises:

comparing the determined at least one motion characteristic to each of a plurality of stored analyte particle motion characteristics; and

determining the identity of the analyte particles based, at least, in part on the comparisons.

5. The spectrometer of any of the preceding claims, wherein the detector is an optical detector.

6. The spectrometer of any of the preceding claims, further comprising:

a filtering stage configured to filter the analyte particles from other components in the solution to produce a filtered solution, and

wherein the electrode is arranged to trap the analyte particles in the filtered solution.

7. The spectrometer of any of the preceding claims, wherein the analyte particles are viruses or bacteria.

8. The spectrometer of any of the preceding claims, wherein the electrode is configured to affect motion of the analyte particles along the surface of the electrode.

9. The spectrometer of any of the preceding claims, wherein the at least one motion characteristic is a motion trajectory.

10. A method of determining an identity of analyte particles in a solution, the method comprising:

placing an electrode in an AC electric field;

switching at least one property of the AC electric field from a first condition to a second condition, wherein when the AC electric field is in the first condition, the analyte particles are trapped in a first AC kinetic trap on the electrode and wherein when the AC electric field is in the second condition, the analyte particles trapped in a second AC kinetic trap on the electrode;

determining at least one motion characteristic of the analyte particles from the first AC kinetic trap to the second AC kinetic trap in response to switching the at least one property of the AC electric field; and

determining an identity of the analyte particles based, at least in part, on the determined at least one motion characteristic.

11 The method of claim 10, wherein switching the at least one property comprises switching a frequency of the AC electric field and/or an amplitude of the AC electric field.

12. The method of claim 10 or 11, wherein determining an identity of the analyte particles comprises:

comparing the determined at least one motion characteristic to each of a plurality of stored analyte particle motion characteristics; and

determining the identity of the analyte particles based, at least, in part on the comparisons.

13. The method of any of claims 10-12, wherein determining at least one motion characteristic of the analyte particles comprises determining the at least one motion characteristic using an optical detector.

14. The method of any of claims 10-13, further comprising:

filtering the analyte particles from other components in the solution to produce a filtered solution, and

wherein determining at least one motion characteristic of the analyte particles from the first AC kinetic trap to the second AC kinetic trap in response to switching the at least one property of the AC electric field comprises determining the at least one motion characteristic of the analyte particles in the filtered solution.

15. The method of any of claims 10-14, wherein determining the at least one motion characteristic comprises determining a motion trajectory.