CLAIMS

What is claimed is:

1. A system for performing real-time analysis on a chromatography column comprising:

a chromatography column;

a conductivity meter; and

at least one processor for executing stored program instructions to:

measure one or more conductivity values of the chromatography column using the conductivity meter,

determine a baseline conductivity value by recording a predetermined number of conductivity values from a first column volume to a second column volume and calculating an average of the predetermined number of conductivity values, wherein the baseline conductivity value is the calculated average,

determine whether a first measured conductivity value is less than a maximum conductivity value and is greater than a 10% peak falling value, and based on the determination, record a time and a column volume corresponding to the first measured conductivity,

determine whether a second measured conductivity value is less than the maximum conductivity value and is greater than a 50% peak falling value, and based on the determination, record a time and a column volume corresponding to the second measured conductivity,

detect whether 10% falling of conductivity is reached, and

based on the detection, calculate one or more of: (i) a time-based asymmetry factor and (ii) a volume-based asymmetry factor or calculate one or more of: (i) a time-based Height Equivalent of a Theoretical Plate (HETP) value and (ii) a volume-based HETP value based at least in part on the baseline conductivity value, the times

and column volumes of the first measured conductivity and the second measured conductivity, and the maximum conductivity value, and output a control signal for adjusting cell culture conditions in the chromatography column based on the calculation in order to maintain an environment in the chromatography column.

2. The system of claim 1, wherein the 10% peak falling value is equal to:

((the maximum conductivity value – the baseline conductivity value) * 0.1) + the baseline conductivity value, and

wherein the 50% peak falling value is equal to:

((the maximum conductivity value – the baseline conductivity value) * 0.5) + the baseline conductivity value.

3. The system of claim 1, wherein the at least one processor further executes stored program instructions to:

determine whether the maximum conductivity value is greater than a previously recorded maximum value, and

based on the determination, record a time and a column volume corresponding to the maximum conductivity value.

4. The system of claim 1, wherein the at least one processor further executes stored program instructions to record a time and a column volume for each of the measured one or more conductivity values of the chromatography column, and wherein each time is recorded in a fixed-size time array and each column volume is recorded in a fixed-size volume array.

5. The system of claim 1, wherein the measured one or more conductivity values, when plotted in relation to time or volume, graphically represents a conductivity peak, and the at least one processor further executes stored program instructions to record a plurality of times and column volumes corresponding to each of the respective measured conductivity values on a rising side of the conductivity peak.

6. The system of claim 5, wherein the detection of the 10% falling of conductivity occurs on a falling side of the conductivity peak.

7. A method for performing real-time analysis on a chromatography column, the method comprising:

measuring, by at least one processor, one or more conductivity values of the chromatography column using a conductivity meter;

determining, by the at least one processor, a baseline conductivity value by recording a predetermined number of conductivity values from a first column volume to a second column volume and calculating an average of the predetermined number of conductivity values, wherein the baseline conductivity value is the calculated average;

determining, by the at least one processor, whether a first measured conductivity value is less than a maximum conductivity value and is greater than a 10% peak falling value, and based on the determination, recording a time and a column volume corresponding to the first measured conductivity;

determining, by the at least one processor, whether a second measured conductivity value is less than the maximum conductivity value and is greater than a 50% peak falling value, and based on the determination, recording a time and a column volume corresponding to the second measured conductivity;

detecting, by the at least one processor, whether 10% falling of conductivity is reached; and

based on the detection, calculating, by the at least one processor, one or more of: (i) a time-based asymmetry factor and (ii) a volume-based asymmetry factor or calculating one or more of: (i) a time-based Height Equivalent of a Theoretical Plate (HETP) value and (ii) a volume-based HETP value based at least in part on the baseline conductivity value, the times and column volumes of the first measured conductivity and the second measured conductivity, and the maximum conductivity value, and outputting a control signal for adjusting cell culture conditions in the chromatography column based on the calculation in order to maintain an environment in the chromatography column.