APPLICATION NOTE

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MEASURING EXCIPIENTS IN DOWNSTREAM BIOPROCESSING

INTRODUCTION

The formulation of biologics, including therapeutic proteins, vaccines, gene therapies, and monoclonal antibodies, represents a unique and complex challenge in the production of biopharmaceuticals. These large, complex molecules require careful handling and formulation to maintain stability, activity, and safety throughout their shelf life and upon administration to patients. Excipients play a crucial role in this process, serving as the backbone of formulation strategies to ensure the viability of these sensitive biological entities. Excipients in biologic formulations serve several key purposes:

Table 1: Common excipients used in downstream bioprocessing

Role in Formulations	Excipient Examples
Buffers	Histidine, Phosphate, Acetate, Citrate, etc.
Sugar and polyol stabilizers	Sucrose, Trehalose, Maltose, Sorbitol, Mannitol
Tonicity agents	Sucrose, NaCl, Trehalose, Mannitol
Surfactants	Polysorbate 20 and 80, Poloxamer 188
Amino acid stabilizers	Arginine, Proline, Glycine, Histidine, Methionine
Chelating agents	DTPA, EDTA
Viscosity modifiers	Arginine, Proline, Glycine, NaCl
Antioxidants	Methionine

In downstream bioprocessing, excipients are ubiquitous, yet no rapid, at-line method exists to quickly perform confidence checks on stock solutions or formulation preparations. Quality risks remain high in the absence of rapid and accurate excipient analysis. Without a simple in-process quantitative assay with broad excipient coverage, scientists must resort to complicated post-run analytics yielding results days to weeks later. When anomalies are detected, it is too late to prevent loss of invested time and money. Our high precision tunable laser system now offers excipient concentrations in minutes, without the need for sample prep. This tool empowers scientists to proactively identify costly quality issues and mitigate risks associated with potential excipient inconsistencies.

THE WORKFLOW: TIME-TO-INSIGHT IN LESS THAN A MINUTE

1 PIPETTE 15 µL
of sample (no dilution or preparation)

2 CLOSE THE COVER
to kick off your run

3 REVIEW YOUR DATA
quantitative results on each of your excipients

5 SECONDS — 10 SECONDS — 45 SECONDS

illuminating insights

EXCIPIENT MEASUREMENTS OF COMMON BUFFERS

Example buffers were created with select excipients from table 1 to highlight the analyte breadth, accuracy, and precision of the system.

Table 2: Quantitative results from the high precision tunable laser system. All solutions were made using a precision scale and volumetric flask.

Buffer	Excipients	Target	Sample Replicates	Mean (% error)	STD
1	Histidine	20 mM	(20.30, 19.94, 20.41) mM	20.22 mM (1.1 %)	0.2 mM
2	Polysorbate 20 stock	10 %	(10.109, 10.069, 10.110) %	10.096 % (0.95 %)	0.019 %
3	Histidine	20 mM	(20.7, 20.14, 20.07) mM	20.3 mM (1.5 %)	0.28 mM
	Polysorbate 80	0.05 %	(0.052, 0.050, 0.051) %	0.051 % (1.9 %)	0.0008 %
4	Sodium Acetate	20 mM	(25.72, 24.86, 25.34) mM	25.31 mM (1.25 %)	0.43 mM
	Sodium Chloride	75 mM	(78.14, 75.63, 77.98) mM	77.26 mM (3.01 %)	1.40 mM
5	Histidine	20 mM	(19.92, 21.4, 20.07) mM	20.46 mM (2.3 %)	0.67 mM
	Arginine	100 mM	(104.0, 104.3, 104.7) mM	104.33 mM (4.3 %)	0.29 mM
	Sucrose	200 mM	(197.1, 197.0, 196.5) mM	196.86 mM (1.6 %)	0.26 mM
	EDTA	8 mM	(8.10, 7.70, 8.11) mM	7.97 mM (0.37 %)	0.19 mM
6	Sodium Phosphate	20 mM	(20.541, 18.7, 20.46) mM	19.9 mM (0.5 %)	0.849 mM
	Mannitol	10 %	(9.9, 9.99, 9.89) %	9.93 % (0.7 %)	0.04 %

CONCLUSION

Our high precision tunable laser system puts the power of rapid excipient analysis in your hands with zero sample prep, small sample volume, and coverage of all your critical excipients in a single method in <3 minutes time-to-answer. Gone are the days of retrospective HPLC data or the burden of running multiple slow, complicated methods on a limited sample set. Save time and resources by avoiding process errors with a simple scan to confirm concentrations with demonstrated precision and high accuracy (under 5% from target values). The system elevates process outcomes by providing visibility into critical buffer components, thereby accelerating process development and the delivery of high-quality medicines to market.