APPLICATION NOTE

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QUANTITATION OF SURFACTANT IN STOCK SOLUTIONS AND FORMULATIONS

INTRODUCTION

Surfactants play a crucial role in bioprocessing due to their ability to stabilize proteins, prevent aggregation, and enhance solubility, which is vital for the production and purification of biopharmaceuticals. They ensure the stability and efficacy of biological products, from therapeutic proteins to vaccines, by maintaining the integrity of these molecules throughout the bioprocessing workflow.

However, two problems exist:

1. Measuring surfactant stock solutions is not common practice. This is the starting place for future formulations and is critical to mitigating further downstream issues, yet no technology exists to provide this information in a timely and robust fashion.
2. Measuring surfactants accurately within the complex matrices of bioprocessing formulations is challenging due to their diverse chemical properties, low concentrations, and the presence of interfering substances, necessitating advanced analytical techniques for precise quantification.

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

Here, our high precision tunable laser system demonstrates the ability to measure surfactant in stock solutions (high concentration) and formulations (low concentration) with the following highlights:

- **Simple workflow:** current analytical methods struggle with complicated workflows requiring dilution, sample prep and complex analysis
- **Wide dynamic range:** current methods struggle with surfactant across a wide range, requiring significant method development, leading to potentially erroneous and difficult to repeat
- **Accuracy with matrix interference:** complex matrices can pose a problem for measuring surfactants with current methods but are no problem for our system

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

SURFACTANT IDENTIFICATION AND QUANTITATION OF STOCK SOLUTIONS

The system utilizes a calibrated library of surfactants, validated via HPLC. When scanning a stock solution, the results are displayed as the stock spectrum overlaid with the validated library spectrum, correlation coefficient to confirm identity and calculated concentration with error. Example stock solution scans for Polysorbate 20, Polysorbate 80 and Poloxamer 188 are seen in Figure 1.

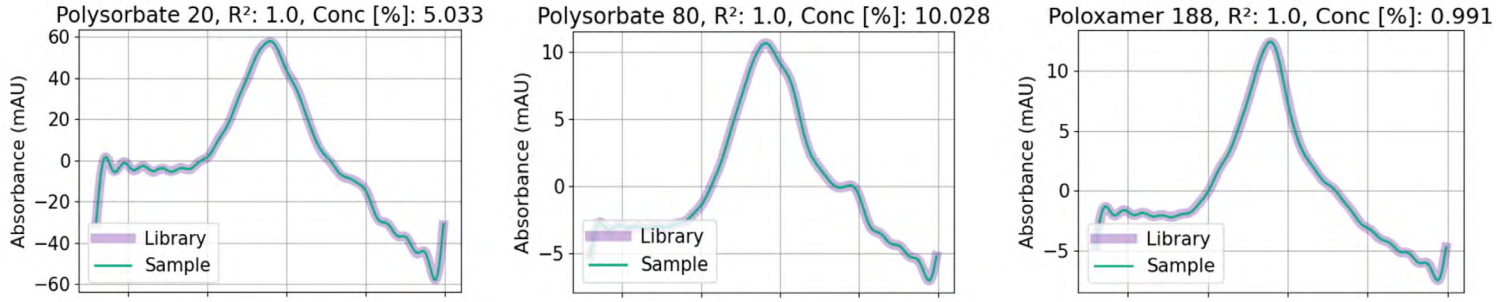

Figure 1. Example stock solution scans (—) for Polysorbate 20, Polysorbate 80 and Poloxamer 188 at target concentrations of 5%, 10% and 1%, respectively, overlaid on validated library spectrum (—). Surfactants were confirmed via correlation coefficient to the validated library (R^2=1.0) and concentrations were reported as within 1% of the target value. X-axis is in wavelength space.

SURFACTANT CONCENTRATION MEASUREMENTS IN COMPLEX FORMULATIONS

The following examples highlight the power of the system – never before has an at-line instrument been capable of measuring surfactants in complex matrices. Polysorbate 20 was measured at 0.069% (0.07% target concentration) in a formulation of histidine, arginine and sucrose. Polysorbate 80 was measured at 0.009% (0.01% target concentration) in a formulation of mAb, histidine, arginine, EDTA and sucrose. Finally, Poloxamer 188 was measured at 0.029% (0.03% target concentration) in a formulation of BSA, histidine and sucrose.

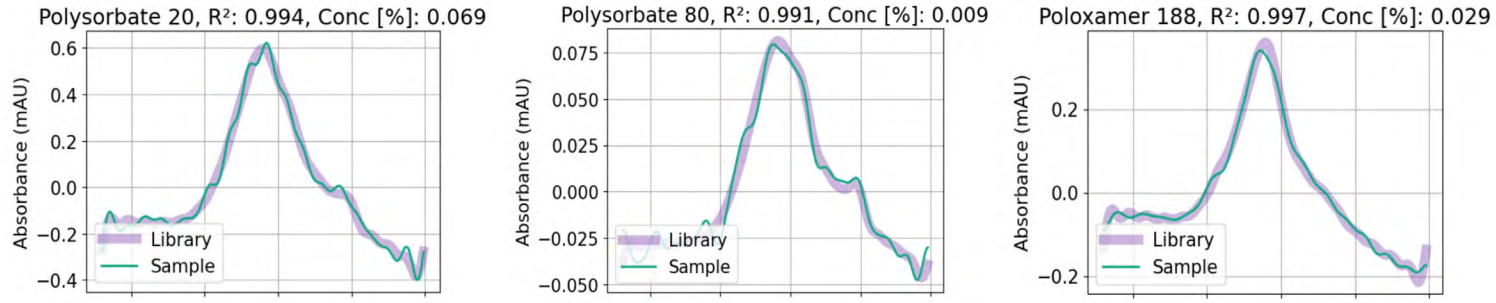

Figure 2. Result scans (—) for formulations containing Polysorbate 20, Polysorbate 80 and Poloxamer 188 at target concentrations of 0.07%, 0.01% and 0.03%, respectively, overlaid on validated library spectrum (—). Measured surfactant concentrations were found to be in good agreement with target values. X-axis is in wavelength space.

DISCUSSION

In this Application Note, our high precision tunable laser system demonstrated the ability to identify and measure the concentrations of three surfactants, Polysorbate 20, Polysorbate 80 and Poloxamer 188, from stock solutions and within complex formulations at lower concentrations. This invaluable tool can be used to provide peace of mind in buffer and formulation preparation, mitigating any potential risks associated with incorrect concentrations. Furthermore, save time and money by not shipping samples out for HPLC analysis or developing HPLC methods to measure surfactant in your formulation. This truly versatile instrument represents the next most important tool to have in the bioprocessing toolbox.