Calibration Standards for Microscopy Measurements

Technology #2019-130

A high lipids content microdot calibration standard array that enables ultraquantitative analyses

The available technology is a novel formulation for inkjet printing and the resulting printed microdot calibration standard arrays that will be useful in performing absolute quantification of cellular biomolecules using techniques such as Raman spectroscopy and mass spectrometry. The biomolecules are printed on a silicon wafer using a nano-inkjet printer to tightly control the amount of bioink in each microdot. The key advance that enables this technology is the utilization of synthetic lipid compounds that enable the water-based ink to contain the high, biologically relevant concentrations of lipids needed to provide an accurate calibration standard. These calibration standards are the first of their kind and have been successfully used to quantify proteins, lipids, carbohydrates, and nucleic acids within heterogeneous cell populations in absolute terms. Lipophilic small molecules can be incorporated into the standards as well, enabling the simultaneous quantification of cellular uptake and localization of compounds of interest. This foundational technology will greatly advance the potential for clinical usage of Raman spectroscopy and will enable in depth toxicokinetic and pharmacokinetic analyses.

Applications

· As a biomedical research tool for studying changes in cellular biomolecule composition using ultraquantitative Raman spectroscopy.
· For developing advanced clinical tests for biomolecule storage diseases (such as Niemann-Pick Disease Types A and C) using Raman spectroscopy.
· With a variety of other single-cell analytical techniques such as laser assisted mass spectrometry.

Advantages

· Enabling the absolute quantification of biomolecules using Raman spectroscopy will enable the direct comparison of datasets collected at different laboratories on distinct instruments.
· Quantitative results
· Unlike other quantification techniques, this methodology is non-destructive and does not require the use of exogenous labels for signal generation.

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