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# Mixing Control in Therapeutic Samples using Schlieren

**A portable, efficient, and real-time Schlieren-based technology non-intrusively detects and visualizes inconsistencies in liquid samples, ensuring quality control for therapeutic and commercial solutions.**

Researchers at Purdue University have developed a real-time monitoring technology that detects and visualizes heterogeneities in liquid samples, such as proteins, antigens, and other pharmaceutical solutions. Utilizing an all-lens Schlieren setup, the technology ensures sample consistency by non-intrusively detecting heterogeneities. Antigen, antibodies, and other therapeutic biomolecule solutions are often frozen for storage and shipping purposes. This freezing and thawing process can induce internal stresses in samples, resulting in aggregation, heterogeneities, and overall reduction in quality. Therefore, monitoring is crucial to ensure samples are properly mixed before using it in desired applications.

This Schlieren-based concentration gradient visualization tool is a novel and transformative technology for studying the impact of freezing, thawing, and mixing conditions of liquid samples, notably on therapeutic solutions. Unlike the standard ELISA, this mixing control technology is faster and provides real-time analysis. It generates affordable solutions with a swift development timeline and is applicable to a wide range of therapeutic samples. This technology's portability and accuracy in quantifying concentration gradients are superior compared to fractionating the sample or injecting it out in small amounts. The technology provides an efficient way to control sample mixing without leading to undesirable instabilities.

**Technology Validation:**

Researchers validated this technology by measuring the diffusion coefficients of sample solutions. A sharp stratification was created between a solution of known concentration (at the bottom) and water (at the top) following visualization using the Schlieren architecture. The sample heterogeneity can be quantified by relating these light intensity variations to concentration gradients.

**Technology ID**
2021-ARDE-69507

**Category**
Pharmaceuticals/Biopharmaceuti
Materials Science & Nanotechnology/Materials Testing & Characterization Tools
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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**Advantages**:

-Simple

-Portable

-Efficient

**Applications**:

-Pharmaceuticals

-Biotechnology

-Consumer goods industry

-Food industry

-Quality control

**TRL:** 4

**Intellectual Property:**

Provisional-Patent, 2021-09-10, United States | Utility Patent, 2022-09-09, United States

**Keywords:** Real-time monitoring technology, liquid sample heterogeneity detection, Schlieren setup, concentration gradient visualization, therapeutic biomolecule solutions, sample consistency, quality control, pharmaceutical solutions, non-intrusive monitoring, mixing control technology, antigen heterogeneities, Biotechnology, mixing control, Pharmaceuticals, sample monitoring, Schlieren