SPECTRAL FLUCTUATION RAMAN SPECTROSCOPY (SFRS)

Tech ID: 32999 / UC Case 2023-058-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

The function of living tissue relies not only on its structure, but crucially on its dynamics at an array of timescales. Structural imaging of biological molecules at very high resolution has become routine in recent years, but these static snapshots provide little insight into the structural changes crucial for biological function. It is well known that changes in the geometry of macromolecules induce fluctuations in the Raman spectrum, but measurements of these fluctuations inherently suffer from poor signal strengths, meaning that dynamics at many timescales are obscured by the time-averaging necessary to obtain sufficient sensitivity.

To address these problems, researchers at UC Berkeley have developed a method for probing the Raman spectrum, and hence dynamics of biological molecules at very high sensitivity and across timescales inaccessible to extant techniques. This technique, in fact, can in principle obtain arbitrarily fine spectral and temporal resolution, opening the door to, for example, probe everything from the dynamics of side chain rotations (picoseconds) to protein folding and domain motion (milliseconds).

SUGGESTED USES

Point-of-care diagnostics of single-cell and protein analytes, large-scale identification of synthetic protein folding states, small-molecule drug discovery, next-generation sequencing (RNA, DNA, proteins), measurement of molecular forces, extensions to scanning-probe microscopy, cancer diagnostics, materials characterization, analytical and bioanalytical chemistry, instrument development in bio-analytical chemistry, characterization of polymeric materials and products

ADVANTAGES

This method allows access to the dynamics of biological molecules such as proteins and nucleic acids at previously inaccessible timescales and arbitrary sensitivity. This could in principle be used to produce a “molecular movie” which would contain all information relevant to the molecule’s biological function.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS
Protein structure, Protein folding, DNA sequencing, Raman spectroscopy, Biomolecular dynamics, Spectroscopy

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