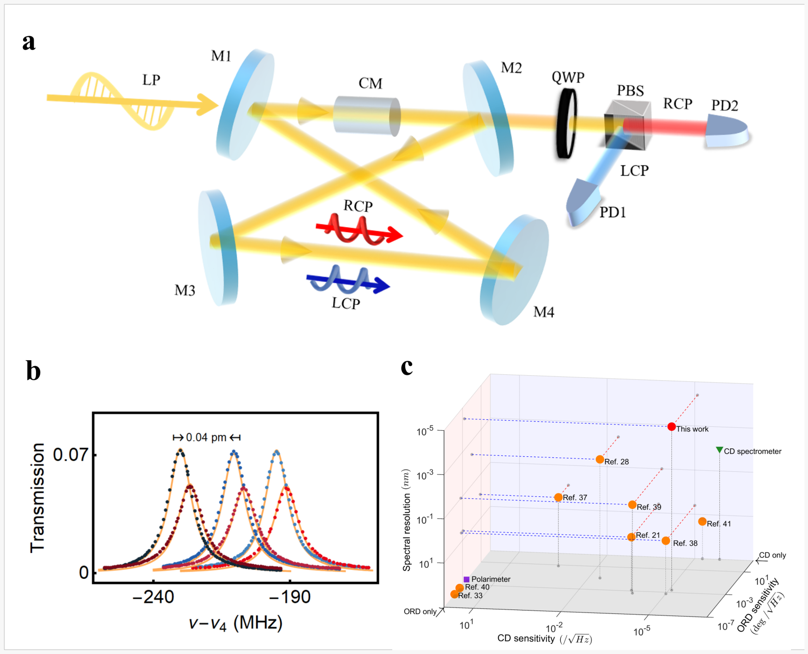
New method for simultaneous high-resolution measurement of chiral molecules

USA, July 12, 2024 /EINPresswire.com/ -- A new study introduces a method for sensitive, simultaneous measurement of optical rotary dispersion (ORD) and circular dichroism (CD) from weak chiroptical signals. The technique utilizes a bowtie optical cavity with moderate finesse, eliminating the need for complex frequency locking or magnetic fields. This approach achieves high sensitivity for both ORD and CD alongside excellent spectral resolution, enabling analysis of challenging biological samples with weak chiroptical features.



Schematic of the ORD and CD measurement.

Researchers have developed a new method for precisely analyzing molecules' chirality. This method, known as cavity-enhanced chiral eigenmode (CECEM) spectroscopy, offers several advantages over existing techniques, including the ability to simultaneously measure two key properties of chiral molecules and achieve exceptionally high spectral resolution.

Chirality refers to the "handedness" of a molecule, like a left and right hand. Many biological molecules are chiral, and their handedness can be crucial in their function. Understanding chirality is essential in various fields, including drug development and material science.

CECEM spectroscopy utilizes a special cavity design to analyze chiral materials. The technique can measure two properties simultaneously. The first one is optical rotatory dispersion (ORD), which indicates how much a chiral material rotates the plane of polarized light. The second is circular dichroism (CD), which reflects a chiral material's differential absorption of left and right circularly polarized light.

Existing methods for measuring ORD and CD often require separate measurements and complex setups. CECEM spectroscopy, however, can determine both properties simultaneously using a single, simplified setup. This not only saves time but also reduces the risk of errors.

Another significant advantage of CECEM spectroscopy is its high spectral resolution. This means it can distinguish between closely spaced features in the chiroptical spectrum, providing a more detailed analysis of the chiral molecule. This high resolution is precious for studying complex molecules with intricate chiroptical properties.

The researchers successfully demonstrated CECEM spectroscopy on various chiral materials, including quartz crystals, sugar solutions, and protein solutions. The technique achieved excellent sensitivity, allowing for the detection of weak chiroptical signals.

This new method has the potential to revolutionize chiroptical analysis. Its ability to provide fast, accurate, and high-resolution measurements of chirality will be valuable for researchers in various disciplines studying the properties of chiral molecules.

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