Chiral Detector for the detection of enantiomers in the liquid phase

Technology

A new, extremely sensitive laser detector for detection the chirality of molecules in the liquid phase is proposed, where the chiral molecules are being sent through a cavity formed by two curved mirrors. Chirality plays a decisive role across physics, chemistry and biology, for example being crucial for encoding genetic information. Many of the receptors in the human body are chiral in nature, so that the chirality of a visiting molecule has a critical effect on recognition and reaction and determination and control of chirality is the target of heavy investment. While the chirality of a pure sample can be deduced relatively easily, a significant challenge is the investigation of solutions consisting of mixtures of two enantiomers.

Innovation

- The Chiral detector makes use of a photonic Bose-Einstein condensate (BEC) to detect enantiomeric excess in the liquid phase
  - operating at room temperture
  - real-time analysis (response time 10 ns)
  - at least two modes of operation:
    - detect the presence of any chiral molecules in an otherwise achiral substance
    - detect small deviations from an ideal racemic mixture

Application

- Detection of chirality of molecules in the liquid phase
- Encoding genetic information of molecules
- R&D in physics, chemistry and life sciences

Developmental Status

- Theoretical feasibility analysis
- Photonic BEC available in three external groups

Responsible Scientist

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Patent Status

Patent application pending

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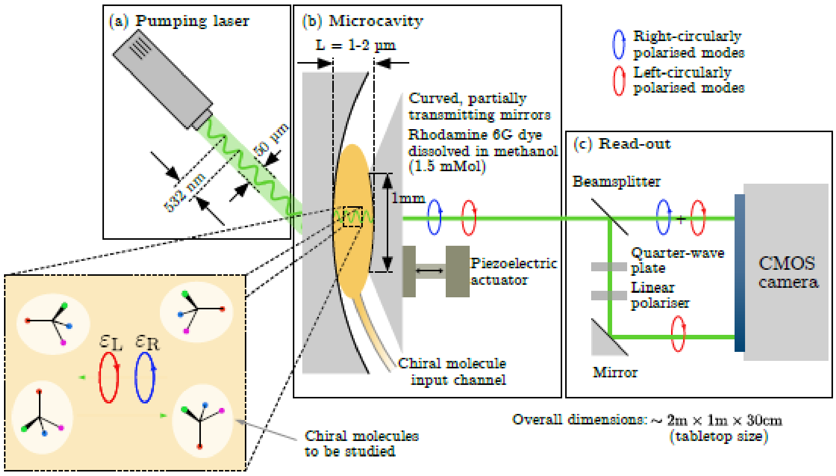
Basis setup of the Chiral Detector



The space between two gently curved mirrors is filled with methanol, into which rhodamine 6G dye is dissolved at a concentration of 1.5 mMol. The light of an external laser excites circularly polarised standing waves inside the cavity. By setting the laser intensity above a given threshold, the dye molecules' particular absorption and emission properties cause only the lowest energy mode to become exclusively excited. Upon inserting chiral molecules into the intracavity liquid, these induce to a small energy splitting between left- and right-circularly polarised waves, leading to an unique circular polarisation of the dominant standing wave. This polarisation of the emerging light is being detected behind the cavity by a polarimeter. It is right- or left-handed, depending on the enantiomeric excess of the detected chiral molecules.