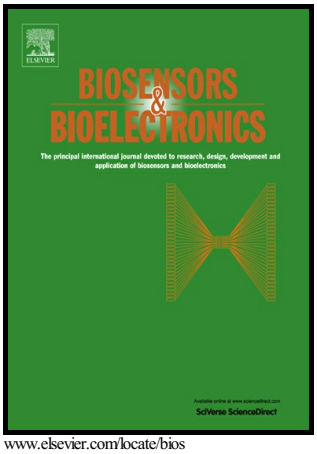
A chiral sensor based on weak measurement for the determination of Proline enantiomers in diverse measuring circumstances

Dongmei Li, Tian Guan, Yonghong He, Fang Liu, Anping Yang, Qinghua He, Zhiyuan Shen, Meiguo Xin



www.elsevier.com/locate/bios

PII: S0956-5663(18)30207-0
DOI: https://doi.org/10.1016/j.bios.2018.03.033
Reference: BIOS10359

To appear in: *Biosensors and Bioelectronic*

Received date: 13 December 2017
Revised date: 15 March 2018
Accepted date: 15 March 2018

Cite this article as: Dongmei Li, Tian Guan, Yonghong He, Fang Liu, Anping Yang, Qinghua He, Zhiyuan Shen and Meiguo Xin, A chiral sensor based on weak measurement for the determination of Proline enantiomers in diverse measuring circumstances, *Biosensors and Bioelectronic,* https://doi.org/10.1016/j.bios.2018.03.033

A chiral sensor based on weak measurement for the determination of Proline enantiomers in diverse measuring circumstances

Dongmei Li[1,2], Tian Guan[1,2], Yonghong He[1,2*], Fang Liu[3], Anping Yang[3], Qinghua He[1,2], Zhiyuan Shen[1,2], Meiguo Xin[3*]

[1]Department of Physics, Tsinghua University, Beijing, 100084, China

[2]Shenzhen Key Laboratory for Minimal Invasive Medical Technologies, Institute of Optical imaging and Sensing, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China

[3]School of Medicine, Foshan University, Foshan 528000, Guangdong, China

heyh@sz.tsinghua.edu.cn

meiguo@fosu.edu.cn

[*]Corresponding author:

Abstract:

A new chiral sensor based on weak measurement to accurately measure the optical rotation (OR) has been developed for the estimation of a trace amount of chiral molecule. With the principle of optical weak measurement in frequency domain, the central wavelength shift of output spectra is quantitatively relative to the angle of preselected polarization. Hence, a chiral molecule (e.g., L-amino acid, or D-amino acid) can be enantioselectively determined by modifying the preselection angle with the OR, which will cause the rotation of a polarization plane. The concentration of the chiral sample, corresponding to its optical activity, is quantitatively analyzed with the central wavelength shift of output spectra, which can be collected in real time. Immune to the refractive index change, the proposed chiral sensor is valid in complicated measuring circumstance. The detections of Proline enantiomer concentration in different solvents were implemented. The results demonstrated that weak measurement acted as a reliable method to chiral recognition of Proline enantiomers in diverse circumstance with the merits of high precision and good robustness. In addition, this real-time monitoring approach plays a crucial part in asymmetric synthesis and biological systems.

Keywords

weak measurement, optical rotation, chiral molecule, Proline enantiomers

1. Introduction:

Natural amino acids are the fundamental structural units of proteins, and they play critical roles in