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Detection of Trace Gas Emissions From Leaves, Seeds and Flowers Using Conventional and Photothermal Deflection Spectroscopy

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Al – Quds University

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DEDICATION

To my mother

To my father

To my husband

To my daughter

To my son

&

To my brother’s Mohamed soul

Yasmeen abdel Jaleel Mohammad Aburayyan

Declaration:

I certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed:…….

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Date:

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Abstract:

Photothermal spectroscopy is a group of sensitive techniques used to study the optical absorption and thermal prosperities of the three material states, by detecting the difference in the deflection of probe beam position. Different kinds of position sensors were used for this aim. These sensors were sensitive but also expensive.

The present work concerned with the study of the effect of trace gases emitted from different samples on the path of the deflection laser probe beam. Two sensitive techniques were used, i.e. conventional light deflection (CLD) which is simple, inexpensive, easy to handle, and a more sophisticated photothermal deflection (PTLD) which employs expensive position sensors and rather more complicated than CLD.

The present work include a new experimental technique, simply a single slit with a photometer is used to investigate the light deflection position difference. The two methods proved their ability to distinguish different gas emissions.

ملخص:

مطيافية التأثير الضوئي الحراري هو مجموعة من التقنيات الحساسة المستخدمة في دراسة خصائص المواد بحالاتها الثلاث، عن طريق قياس التغير في موقع الشعاع الضوئي. تستخدم أنواع مختلفة من أجهزة قياس موقع الأشعة الضوئية، وهي أجهزة حساسة ولكنها أيضا مكلفة.

الدراسة الحالية تشمل دراسة تأثير الغازات القلية المنبعثة من عينات مختلفة على مسار شعاع الليزر المنعكس. واستخدم لتحقيق هذا الهدف طريقتين: طريقة انعكاس الضوء العادية ، وهي بسيطة وغير مكلفة ويسهل إتمامها. و الطريقة الثانية، هي التأثير الضوئي الحراري على مسار الشعاع المنعكس، وهي أكثر تطورا وتحتاج إلى جهاز قياس الموقع الغالي الثمن فهو أكثر تعقيدا من الطريقة الأولى.

العمل الحالي يشمل طريقة جديدة يمكن تجريبها وذلك باستخدام أدوات بسيطة مثل ال single slit و ال photometer المستخدم لقياس التغير في مسار الشعاع الضوئي.

هاتين الطريقتين أثبتتا قدرتهما على كشف انبعاث غازات مختلفة.

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Symbol	Abbreviation representation
CLD	Conventional light deflection
PTLD	Photothermal light deflection
cw	Continuous wave
IR	Infrared radiation
PSD	Position sensitive detector