IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

TRANSDERMAL COLLAGEN AND HEMOGLOBIN SENSOR

IITM Technology Available for Licensing

Problem Statement

- The diagnosis and assessment of skin disorders and the evaluation of cosmetic and anti-aging treatments **currently rely on invasive procedures like skin biopsies** or limited, expensive instruments with bulky instrumentation.
- Hence there is need for creating devices that enables **non-invasive, in-vivo detection** of disease biomarkers, such as **collagen and hemoglobin, in the subsurface layers of the skin.**

Technology Category/ Market

Category – Medical and Surgical
Applications–Biomedical systems, Cosmetics, Sensors, non-invasive techniques
Industry – Healthcare, Biomedical devices
Market -Global Medical Devices Market size was valued at USD 62.6 billion in 2021 and expected to grow from **USD 63.4 billion in 2022 to USD 134.56 billion by 2030**, at a **CAGR of 11.35% in the forecast period (2023-2030).**

Intellectual Property

- **IITM IDF Ref. 1706**
- **IN201841024949**

Research Lab

Prof. SUJATHA N
Dept. of Applied Mechanics

Key Features / Value Proposition

Technical Perspective

- Provides a transdermal fibre optic probe integrated reflectance collection device that is **non-invasive to differentiate normal and schleroderma skin**
- Spectral features of combined **reflectance and fluorescence spectrum** are compared with features of the training dataset for prediction of occurance of the disease

User Perspective

- **Highly efficient and cost-effective** skin collagen and hemoglobin sensor device
- Capable of **assessing the skin condition** under various conditions of ailment during **changes in the subsurface collagen and hemoglobin content.**

Technology

*The invention discloses an **apparatus for measuring/ determining the collagen and/or hemoglobin on a sample (Fig. 1); It includes:***

- **Light Sources-**for exciting and illuminating sample
- **Optical Probe** with a fiber optic probe and an integrated sphere
- **Integrated Sphere-**collect reflected light (reflectance) from the sample.
- **Sensor** -ensures that the probe is at the correct distance from the sample
- **Spectrometer-**sense the collected fluorescence and reflected light
- **Data Processing Unit -**processing data from the fluorescence and reflectance spectra.
- **Display Unit-**displays in the form of fluorescence and reflectance spectra

- A **monochromatic** light source is used **to excite the sample**
- The Optical Probe consists of a **fiber optic probe and an integrated sphere.**
- The fiber probe is connected to the monochromatic light source and has two main sections- **Center Section** having fiber cable that connects to the excitation source for the sample and **Outer Section that** contains a bundle of fiber cables arranged in a circular pattern at the periphery of the center section.

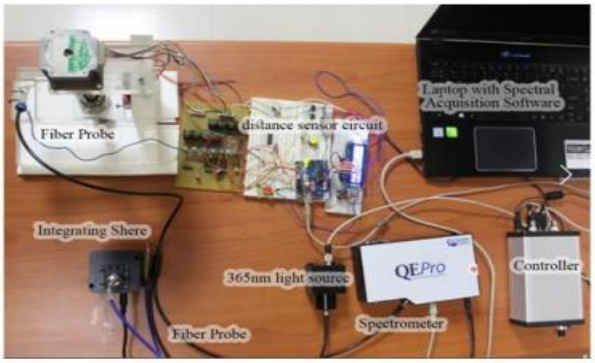

Fig. 1

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

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Further, discloses a method of operation for fluorescence and reflectance measurement that includes:

Fluorescence Measurement

- Positioning the sensor
- Excitation the sample
- Collect the emitted fluorescence light
- Direct the fluorescence light to the spectrometer
- Processing data and Display

Reflectance Measurement

- Illuminate the sample using the light source
- Collect the reflected light from the sample using the integrated sphere
- Directing the collected reflected light into the spectrometer.
- Process the data and Display the reflectance spectrum

Analysis

- Compare and analyze the spectral features of the reflectance and fluorescence spectra
- Utilizing a pre-loaded algorithm for data processing within the processing unit.
- Display the results

Images

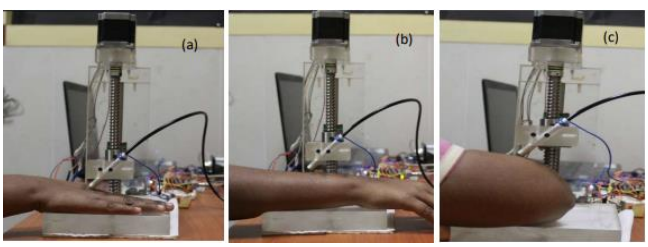

Fig.2: illustrates acquisition of fluorescence spectrum from (a) dorsal palm (b) forearm and (c) above the elbow

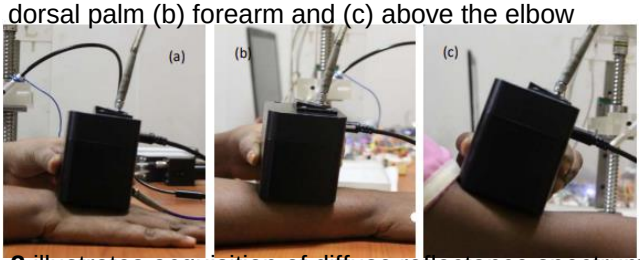

Fig. 3 illustrates acquisition of diffuse reflectance spectrum from (a) dorsal palm (b) forearm and (c) above the elbow

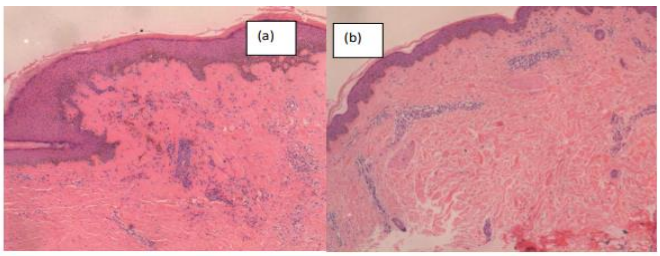

Fig. 4: illustrates Stained microscope images obtained from abnormal **Fig 4 (a)**; and normal biopsy site **Fig. 4(b)**

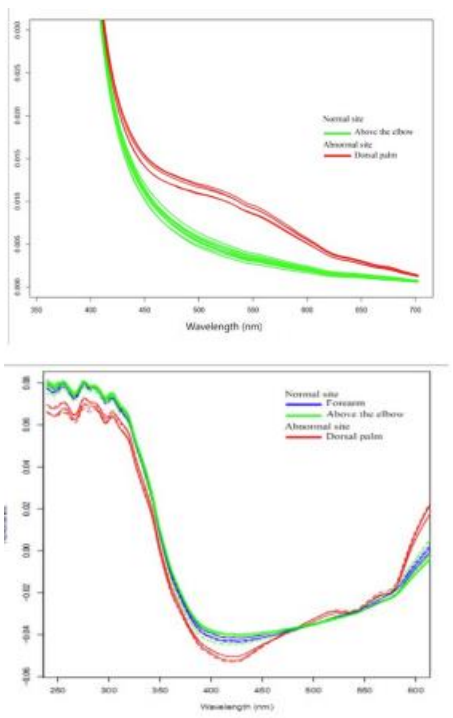

Fig. 5: illustrates (a) fluorescence mode and (b) DRS mode

TRL (Technology Readiness Level)

TRL-5,Technology Validated in Relevant Environment

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IITM TTO Website:
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Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719