



### MULTILAYER SKIN TISSUE MODELS AND METHODS OF PREPARATION THEREOF IITM Technology Available for Licensing

#### Problem Statement

- Optical biopsy measurements are mostly mediated by optical fiber probes placed near the target tissue to record signals under specific modalities of spectral acquisition and analysis.
- For verification, testing and calibration of such newly developed optical diagnostic tools, a special kind of stable, durable and reproducible object with well-controlled optical properties mimicking real tissue is required, which could be achieved with the help of optical phantoms.
- Further, molding techniques proposed in previous reports for fabricating such phantoms are time consuming.
- Precision as well as photo stability of the prepared phantoms are additional concerns. Therefore, there is a need for a low cost optical phantom formed of non-toxic ingredients.

#### Technology Category/ Market

**Category** - Applied Mechanics, Medical Devices

**Applications**- Biomedical optical spectroscopy, Optical biopsy, non-invasive disease diagnosis,

**Industry**- Healthcare, Biomedical, Optical diagnostic instruments, optical phantoms.

**Market** - The global market for biopsy devices was valued at approximately \$2.1 B in 2021 and is expected to grow \$2.2 B by 2022, increasing at a CAGR of 6.8% from 2022 - 2027.

#### Intellectual Property

- IITM IDF Ref. 1631
- IN 201841007589
- PCT/IN2019/050135

#### TRL (Technology Readiness Level)

TRL - 4, Experimentally validated in lab.

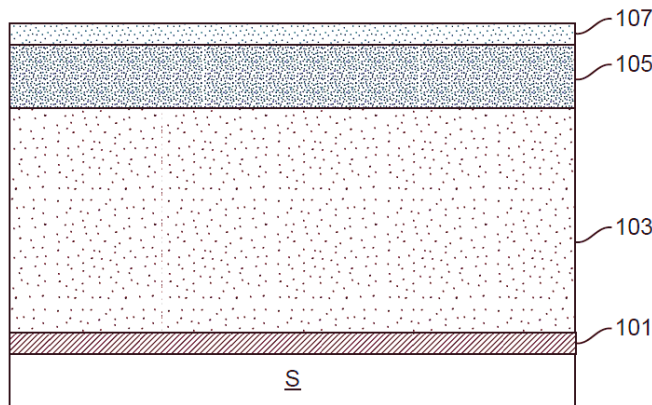


Fig. 1. illustrates a multilayer skin tissue phantom.

#### Technology

- The present invention relates to tissue specific models for diffuse reflectance (DR) studies and in particular to fabrication of solid optical phantoms mimicking skin tissue.
- The disclosure provides for an optical phantom mimicking the diffuse reflectance spectral (DRS) response from human tissue such as skin forearm over a wide spectral range from 280-670 nm.
- The optical phantom (Refer Fig. 1) includes an epidermal layer (107), dermal layer (105), a base layer (103) and a hard tissue layer (101).
- The hard tissue layer (101) is obtained by coating a mixture of barium sulphate and xanthan gum over a glass surface.
- The base layer (103) is obtained by coating a bulk solution of gelatin and intralipid on the glass surface.
- The dermal layer (105) is obtained by coating the bulk solution additionally containing collagen and haemoglobin.
- The epidermal layer (107) is prepared from NADH (Nicotinamide Adenine Dinucleotide), FAD (Flavin Adenine Dinucleotide) and coffee solution added to the bulk solution.

#### Research Lab

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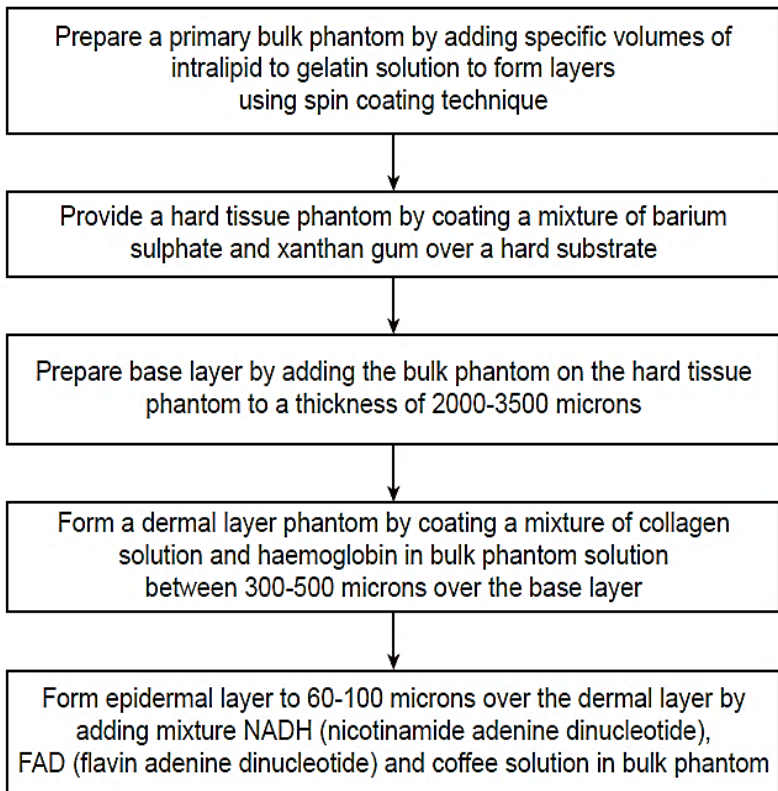
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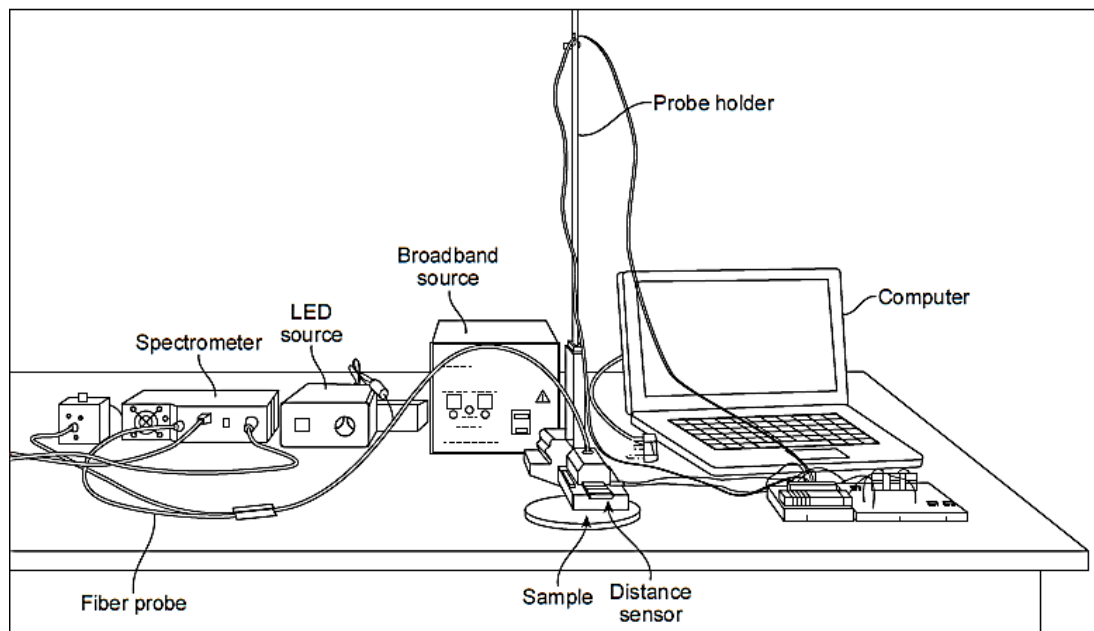
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### Key Features / Value Proposition

1. The **tissue phantom device** disclosed finds use in characterizing and validating the performance of **fiber based DRS probes**.
2. In various embodiments, the phantoms disclosed herein are configured to **demonstrate close correlation of diffuse reflectance (DR) spectra with human forearm skin**.
3. The fabricated phantoms are intended to have high potential in the design and validation of several **optical spectral analysis based instrument systems**, leading to non-invasive optical biopsy procedures in the healthcare industry.
4. Furthermore, as the phantoms are configured to be made tissue specific, the spectral database resulting from the investigations on these phantoms can help in the statistical analysis concerned with ***in-vivo* measurements on specific tissues**.



**Fig. 2. A schematic of the process used to prepare the multilayer skin tissue phantom.**



**Fig. 3. Depicts a system for diffuse reflectance spectral measurement using the multilayer optical phantom.**

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