

Ultra-Structural Characterization of Hair Fiber by Optical Coherence Tomography (OCT)

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Aim: Optical coherence tomography (OCT) is a diagnostic imaging technology in which the coherence features of photons are exploited, leading to a imaging technology that is capable of producing high resolution cross-sectional images of the internal microstructure of living tissue. Its applications in medicine were reported less than a decade ago. The optical sectioning ability of OCT, due to the short temporal coherence of a broadband light source, enables OCT scanners to image microscopic tissue structures at depths beyond the conventional bright-field and confocal microscopes. In this type of technique, light from the source propagates through a 50/50 beam-splitter, where half of the optical intensity is transmitted to the delay line. The remaining half of the light is directed to the sample. The photons that are backscattered from sample internal structure, recombines with delay line photons, producing a cross sectional image. The goal of this work is to use the OCT technique to produce *in vitro* tomographic images of human hair and characterize its principal structures: cuticle, cortex and medulla.

Method: OCT system, represented in **Figure 1**, generated instantaneous tomographic images of Afro-Ethnic hair (DeMeo Brothers) physically fixed in an apparatus able to maintain the fiber in a straight shape, without curve.

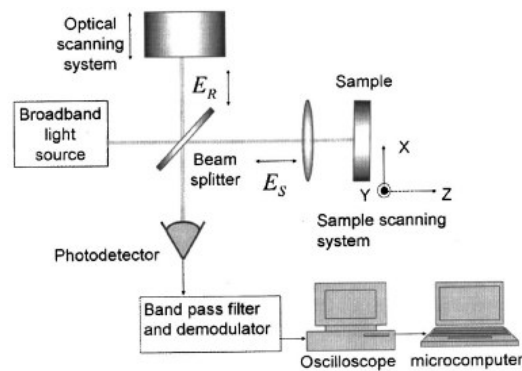


Figure 1. Components of an typical OCT system.

Results and Conclusion: Afro-ethnic hair images presented itself well defined and with resolution to identify the fiber ultra-structures. **Figure 2** illustrates the tomographic image of the hair sample.

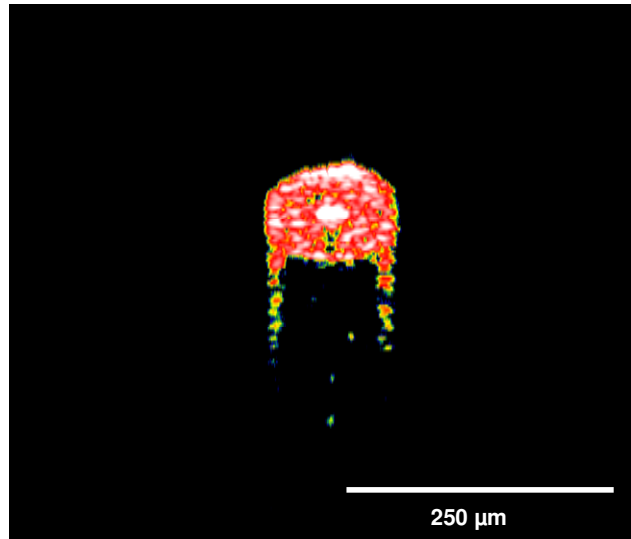


Figure 2. Tomographic image of Afro-ethnic hair by OCT.

The OCT system provided images of the hair sample in which was clearly defined the cuticle, cortex, and medulla. In particular, OCT provided instantaneous images with the advantage of being a non-destructive technique.