FIBERMATE2 AND MULTILOOP-MIR FIBER OPTIC ATR PROBE **NO. 70124**

Mid-Infrared Fiber Optics for In-Situ Studies

Figure 1. The FiberMate™ fiber optic coupler shown with the MultiLoop-MIR™ fiber optic probe.

INTRODUCTION

Mid-infrared ATR spectroscopy is widely used to study human skin. Applications include detection of cancerous tissue and drug absorption studies. These studies are generally done with in-compartment ATR accessories and the sample must be brought in contact with the ATR crystal within the spectrometer sample compartment. More recently, *in-situ* skin analysis by ATR has been extended outside the box using mid-infrared fiber optics; however, the fiber optics used required a high sensitivity MCT detector.

A new high-efficiency fiber optic coupler and state-of-the-art fiber optics now enable out-of-compartment *in-situ* skin studies using a standard DTGS detector.

EXPERIMENTAL

The ATR measurements were recorded using Harrick Scientific's MultiLoop MIR probes with FiberMate™ fiber optic coupler installed in an FTIR spectrometer with a DTGS detector. The probe tips were pressed gently into the skin of a human subject during data collection. Spectra were collected at 8 cm^{-1} resolution with 32 scans signal averaged. Note that the Multiloop-MIR™ includes both a chalcogenide fiber for operation from 6500 to 1700 cm^{-1} and a silver halide fiber for operation from 2000 to 600 cm^{-1}. Spectra were recorded using both fibers and then merged to produce the full-range mid-infrared spectra as shown here.

RESULTS AND DISCUSSION

The ATR spectra of clean skin, NoAd Suncreen®[1] (SFP15), and sunscreen rubbed into the skin are shown in Figure 2. It is clear that the spectrum of

1. NoAd is a registered trademark of Solar Cosmetic Labs, Inc.

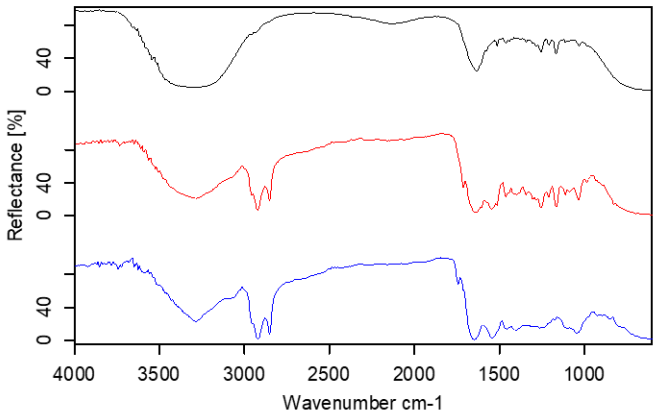

Figure 2. Fiber loop ATR spectra of NoAd sunscreen (black), NoAd sunscreen on skin (red) and clean skin (blue).

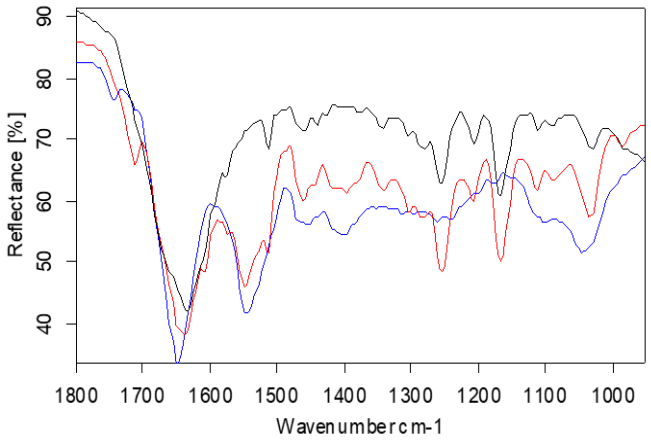

Figure 3. Fiber Loop ATR spectra of NoAd sunscreen RFD 15 (black), NoAd sunscreen on skin (red) and clean skin (blue).

the sunscreen-coated skin shows characteristics from both the underlying skin and the sunscreen. These changes are evident in the OH stretching and fingerprint regions (see Figure 3). The width of the OH band for the sunscreen-coated skin is slightly wider than that of skin and slightly narrower than that of the sunscreen alone.

The sunscreen-coated skin spectrum in Figure 3 clearly resolves bands at 1513, 1255, 1166, and 1031 cm^{-1} that are present in the sunscreen but not in skin.

CONCLUSION

The FiberMate fiber optic coupler and Multiloop-MIR fiber optic probes provide a highly efficient and sensitive fiber optic accessory, enabling *in-situ* out-of-compartment studies of samples such as human skin using a standard DTGS detector.