HARRICK SCIENTIFIC PRODUCTS

No. 21158

ANALYSIS OF NITRILES BY DIAMOND ATR

Figure 1. Two diamond ATR accessories: Single reflection DiaMaxATR (left) and ConcentratIR2 (right).

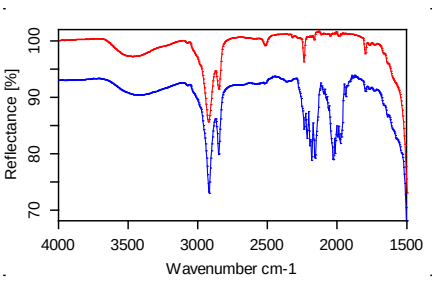

Figure 2. Diamond ATR spectra of the High Five nitrile glove measured using a multiple reflection ATR (blue) and a single reflection ATR (red).

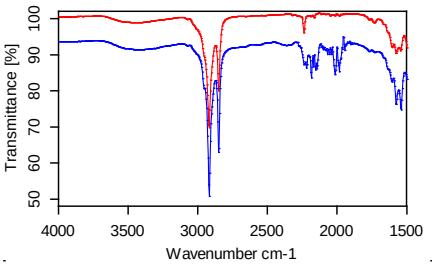

Figure 3. Diamond ATR spectra of the Skintx nitrile glove measured using a multiple reflection ATR (blue) and a single reflection ATR (red).

INTRODUCTION

Diamond ATR has become one of the most commonly used FTIR spectroscopy methods. However, the strong diamond lattice bands in the 2300-1900 cm^{-1} region make it difficult to measure the functional groups from nitriles, isocyanates, isothiocyanates, diimides, azides and ketenes that would normally appear in that region.

This application note compares the sensitivity of a single reflection to multiple reflection ATR for the nitrile functional group infrared transition.

EXPERIMENTAL

Infrared spectra were collected on an FT-IR spectrometer equipped with the Harrick DiaMaxATR™ single-reflection high-throughput diamond ATR accessory or the ConcentratIR2 multiple reflection diamond ATR (see Figure 1). The system was purged to remove water vapor and CO_2. Spectra were collected at 8 cm^{-1} resolution and signal averaged over 32 scans. The spectra were referenced to the clean ATR crystal.

Two samples were examined: a High Five Nitrile Disposable Glove (lightly powdered, textured, P/N N842) and a Skintx Nitrile Examination Glove (GD Care Ind., Azusa, CA). For the single reflection ATR measurement, a portion of the glove was pressed against the ATR crystal using the maximum force supplied by the build-in pressure applicator. For the multiple reflection ATR measurements, the sample was gently pressed against the ATR crystal with compressible foam to fill the trough and to apply as uniform force as possible.

RESULTS AND DISCUSSION

The measured spectra are shown in Figures 2 and 3. In both figures, the blue spectra measured with the multiple reflection ATR show only noise in the 2300-1900 cm^{-1} region due to the high absorbance of diamond in that region. The red spectrum, however, clearly shows the C ≡ N stretch at 2238 cm^{-1}. Another weaker band is also apparent in the single reflection ATR spectrum of the High Five nitrile glove, Figure 2, at 2162 cm^{-1}, possibly indicating the presence of an alkyne group.

CONCLUSION

The Harrick DiaMaxATR, high throughput, single reflection diamond ATR is effective at measuring functional groups that are frequently obscured by the strong diamond lattice bands in the 2300-1900 cm^{-1} region. This makes it more suitable for

applications note

analysis of the function groups in that region, including nitriles, isocyanates, isothiocyanates, diimides, azides and ketenes.

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