



Miniature Raman Spectrometer Measurement of Adhesive Layers

J. Malone, D. Lombardi, and J. Zhou
B&W TEK, Inc.

The B&W TEK MiniRam 785 was used to measure the adhesive layer on a mailing label. The purpose was to learn if a low cost Raman system could be used to measure a moderately thin layer of adhesive without extensive sample preparation.

Experimental

The MiniRam was configured for confocal measurements using the supplied sample probe. Samples were placed on a sample stand with the sample probe located vertically above the sample. With the 7.5 mm focal point, samples were positioned to give maximum signal.

The sample collection point was covered to exclude extraneous light and a series of spectra were collected. Samples used were a series of mailing labels. Spectra were collected from both the adhesive and the non-adhesive sides of all samples.

Results

Figure 1 shows the uncorrected Raman spectra collected from a mailing label. A series of four scans, each integrated for 10 s, was collected for both the adhesive and the non-adhesive sides of the mailing label.

The uppermost spectrum is that of the non-adhesive side, and the lower spectrum is that of the side with the adhesive layer. The spectra show the presence of fluorescence as well as Raman scatter in the samples. This is expected, given that cellulose materials often exhibit fluorescence when excited at 785 nm.

Figure 2 is the result of the subtraction of the spectrum of the non-adhesive side from the adhesive side. As these data show, there are clearly some peaks which are almost certainly due to the adhesive material on the label. The process of spectral subtraction has the effect of “straightening” the baseline as broad features, such as fluorescence, are discriminated against in the subtraction process.

The difference peaks at 1000, 1100, 1450, and 1670 cm^{-1} of Raman shift are the most prominent. Published literature suggests that these may be related to phenyls, and C = C stretching.

Discussion

The ease of sampling and the efficiency of data collection show that the MiniRam Raman spectrometer can easily distinguish between the adhesive and non-adhesive sides of labels. The total time to collect these data was only a few minutes, illustrating the ease of use of the B&W TEK MiniRam Raman spectrometer system.

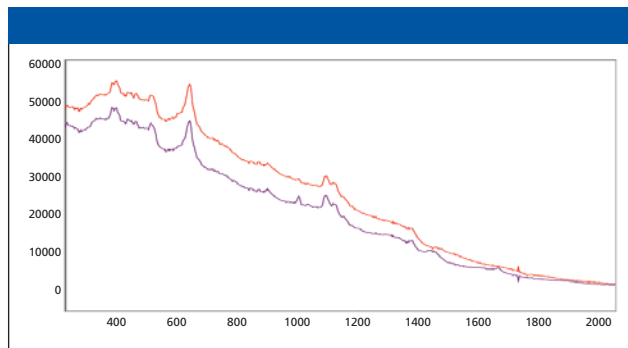


Figure 1: Mailing label Raman spectra.

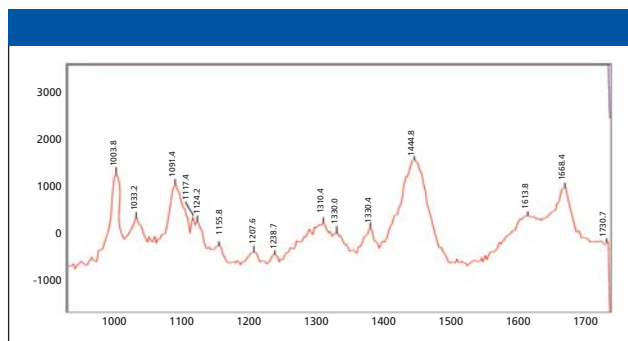


Figure 2: Difference between adhesive and nonadhesive sides.

The presence of fluorescence in the samples is unsurprising. The fluorescence signal is many times stronger than the Raman scatter when excited by an appropriate wavelength such as 785 nm. Like the Raman signal, the fluorescence signal is related to the structure of the molecule – or impurities that may be present. In any case, fluorescence is a feature of the sample when examined under these conditions. Many techniques, including derivative spectroscopy and applications of various FT schemes, exist to remove the effects of fluorescence, if desired.

B&W Tek, Inc.

19 Shea Way
Newark, DE 19713
Tel. (302) 368-7824, Fax (302) 368-7830
info@bwtek.com, www.bwtek.com