Application Note 58: NIT Spectra of Plastic Films, Polymers and Solvents

Introduction:

NIR Transmission Spectroscopy provides a means of measuring C-H, O-H and N-H in a broad array of plastics and polymers. This simple study was conducted to demonstrate the ability of the NIT-38 Polymer Analyser to collect NIT spectra of various plastic films, polymers and solvents.

Description:
Samples of Polyethylene, Polypropylene, Polystyrene, Polycarbonate films were scanned using the NIT-38 Polymer Analyser. Samples of Xylene, Acetone and Ethanol were scanned in a 20mm pathlength cuvette. A sample of Silicon Adhesive was scanned as the material hardened on a glass slide.

Results:
Figure 1 through 4. shows the spectra of the plastics films.

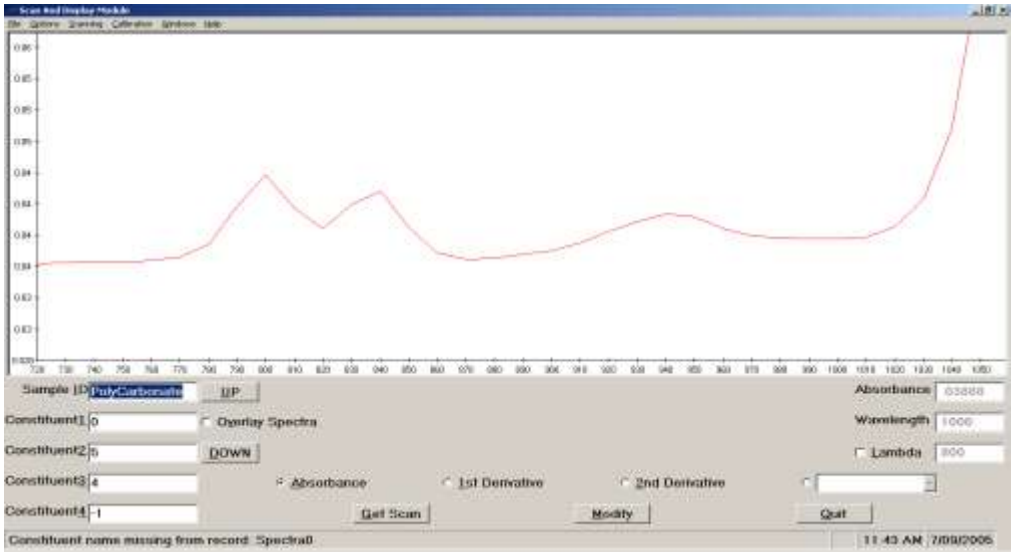

Figure 1. Plot of NIT Spectrum of Polycarbonate Sheet, 5mm thickness.

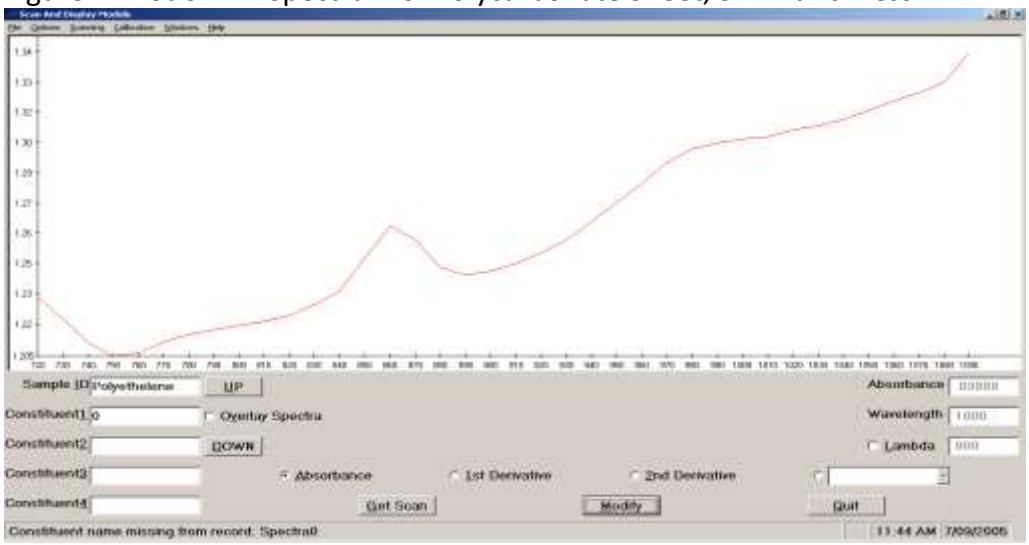

Figure 2. NIT Spectrum of Polyethylene Bag, 4 pieces.

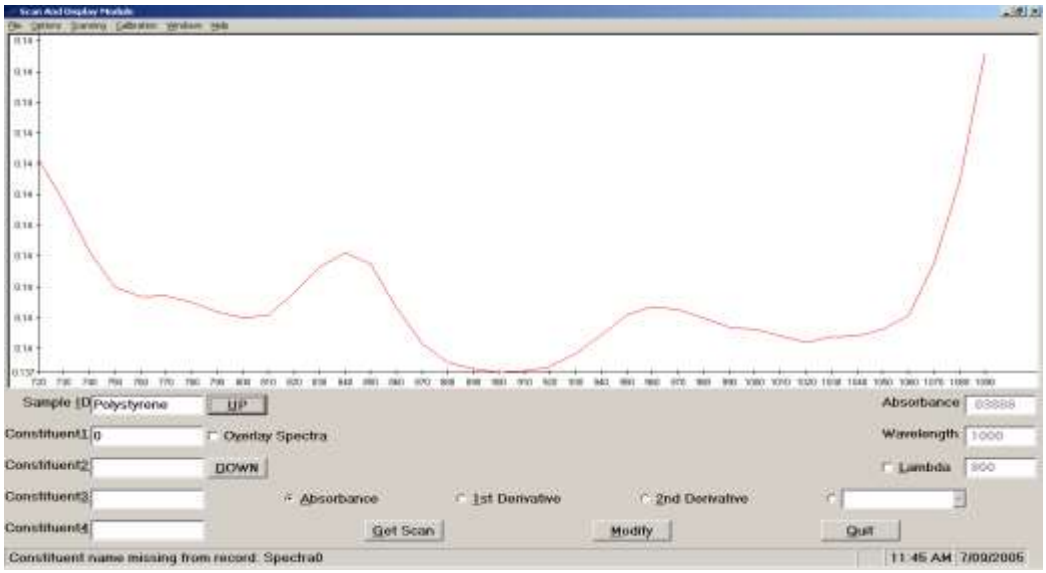

Figure 3. NIT Spectrum of Polystyrene Film, 4 pieces.

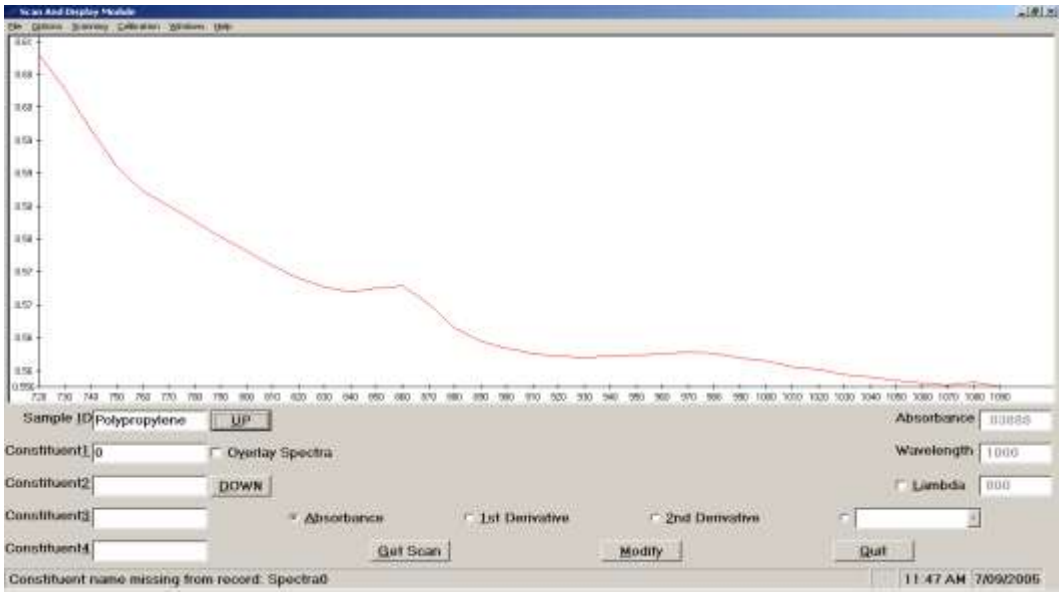

Figure 4. NIT Spectrum of Polypropylene Film, 4 pieces.

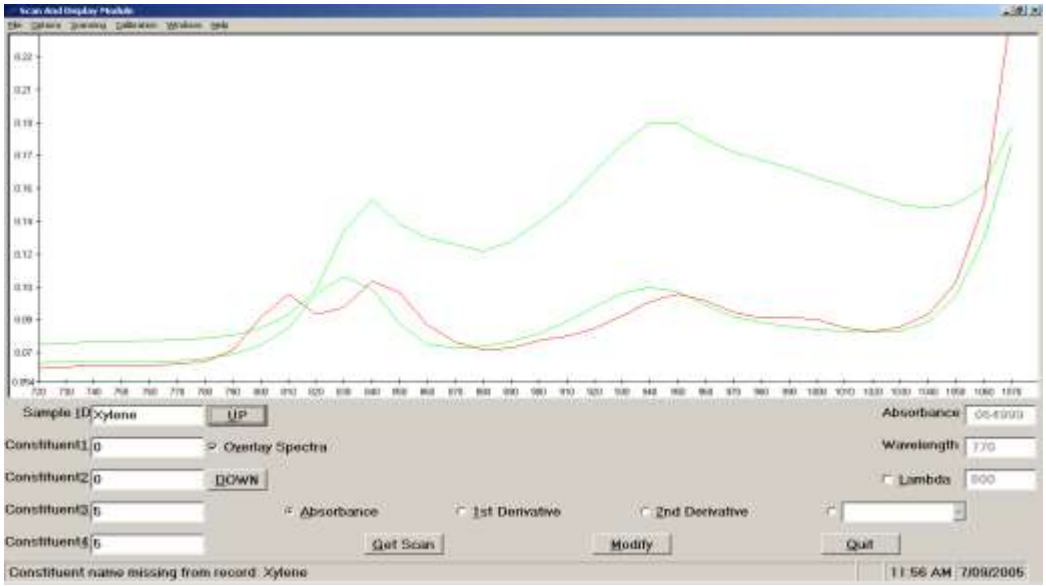

Figure 5. NIT Spectra of Solvents: Xylene(Red), Ethanol(Green Top), Acetone(Green Lower)

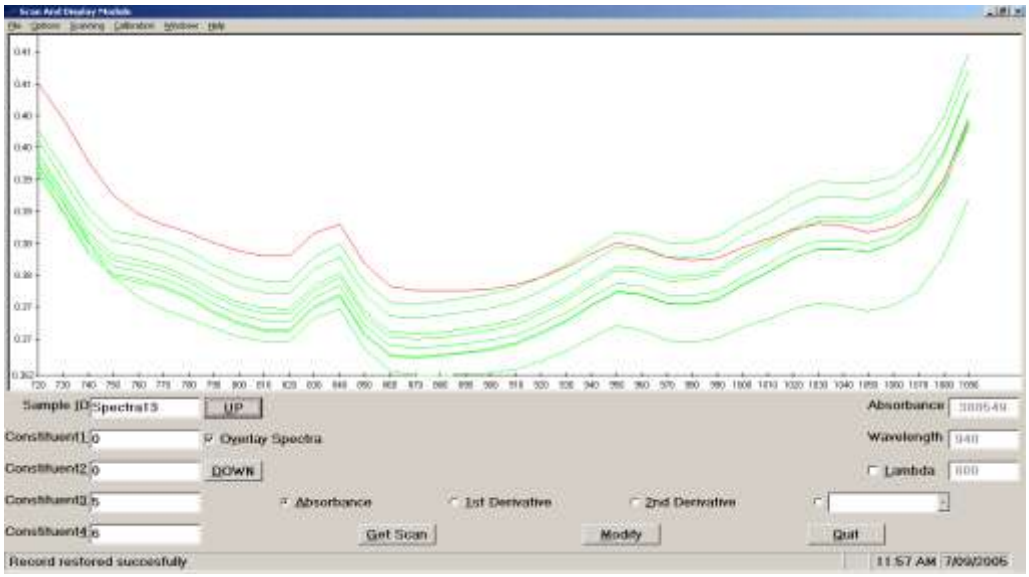

Figure 6. NIT Spectra of Silicon Adhesive during hardening. The Red spectrum is the final hardened material.

Comments:

This study is intended to demonstrate the spectral differences between various plastics, polymers and solvents. Since the NIR spectra contain only C-H, O-H and N-H absorbance bands, the spectra are relatively simple as compared with Mid IR(FTIR) spectra. The advantage of using the NIR spectral region is ease of sample presentation, ie, all these samples were scanned in their natural state. Also the NIR spectra are easy to interpret and changes in chemical bonds occurring during polymerisation reactions are easily detected and quantified.

The spectral region 720-1100nm, as used in the NIT-38 Polymer Analyser, is suitable for measuring thin films, ie, less than .5mm thick, and through long pathlengths, ie, 20-30mm. The use of fibre optics in this region of the spectrum is also an advantage as low cost fibre optic bundles can be used over long distances.

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