A Simple, Inexpensive Method Of Sample Preparation For Infrared Microscopy

Kathy Feltovich & Gerry Goldfinger
Delphi Chassis Systems, Dayton, OH

The use of infrared microspectroscopy for examining polymer systems has been well known for some time. Fibers, inclusions in polymers and multilayered films have been examined by this technique.[1] One limitation of the technique is the difficulty of sample preparation. A variety of methods have been proposed to prepare the sample including excising an inclusion, microtoming and the use of diamond cells to squeeze the sample into an appropriate thickness. Spectra-Tech purveys a diamond Micro Plane to prepare thin sections of polymers as well as an ATR objective to avoid the necessity of preparing thin sections. Ing Shaw et al. have proposed the use of a fiber microtome to prepare samples and claims that this technique is faster and easier than conventional microtoming.[2]

The method used in this laboratory is to mount the sample in a metallurgical vise and to skive a sample using a single edged razor blade using a 30x stereo microscope to view the sample. The vise is used to stabilize the sample for cutting but is not used to control the thickness of the slice (Figure 1). Surprisingly uniform samples on the order of 20 microns thick can be obtained in a short time by an experienced operator. In our laboratory, over eighty samples have been prepared and identified in a single day using this technique.

A typical sample examined in this laboratory is an inclusion in a plasticized sheet used for instrument panel covers (Figure 2). The infrared spectrum (Figure 3) of the inclusion is of good quality and the inclusion can be identified as plasticized PVC-ABS. Samples that are considered to be difficult to microtome such as fiberglass composites circuit boards (Figure 4) can also be examined by this technique. The IR spectra (Figures 5 & 6) of the two layers show the use of epoxy resins of different compositions.

A wide variety of polymeric substances can be examined by this technique. At this time, we have been able to handle most polymers with the notable exception of elastomers. These must be sectioned by traditional cryo-microtoming. All photomicrographs were obtained using the Polaroid Microcam attached to the Spectra Tech IR Plan microscope with the Reflachromat 15X objective. ■

1. Patricia Roush, Editor; The Design, Sample Handling and Applications of Infrared Microscopes; ASTM STP 949 (1987).
2. Tsuey Ing Shaw, Frank Karl, Anoop Krishen and Leo Porter; *Spectroscopy*, 8, 45 (1993).

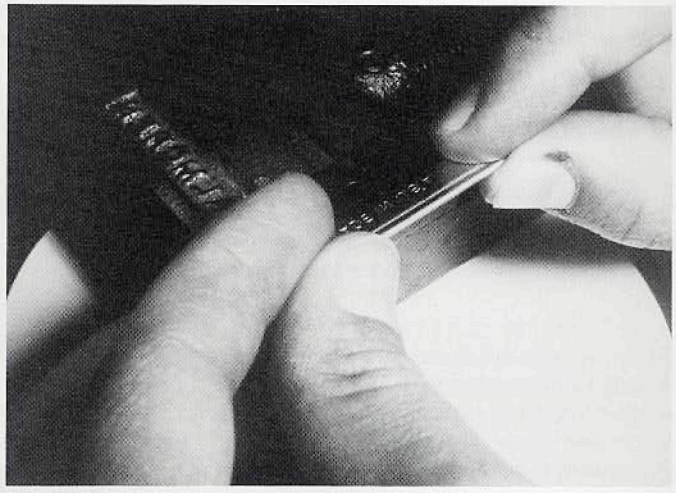

Figure 1

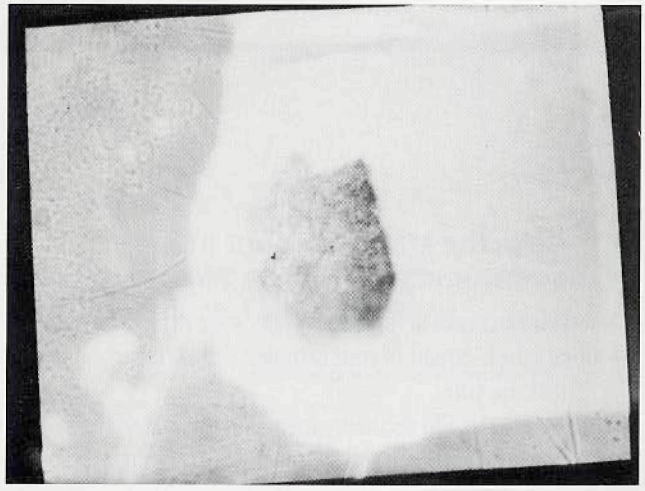

Figure 2

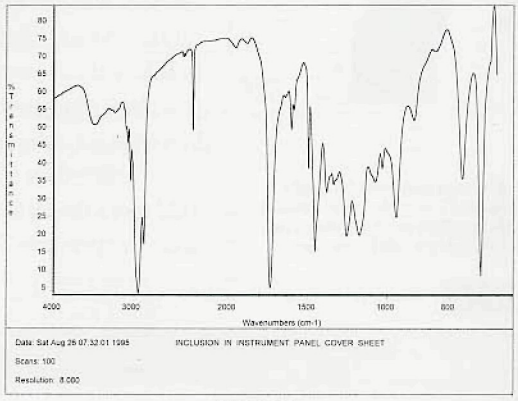

Figure 3

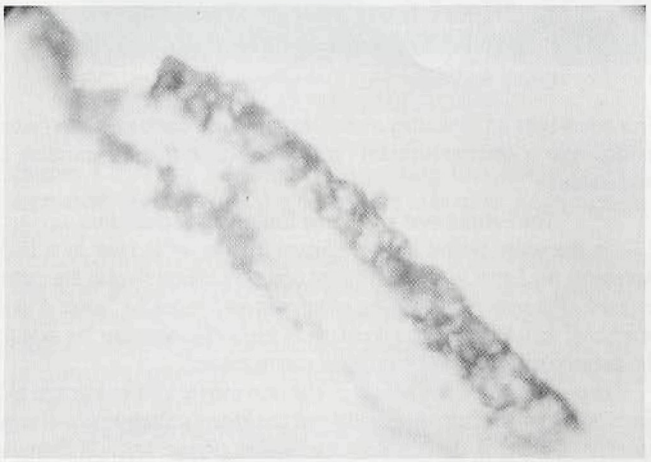

Figure 4

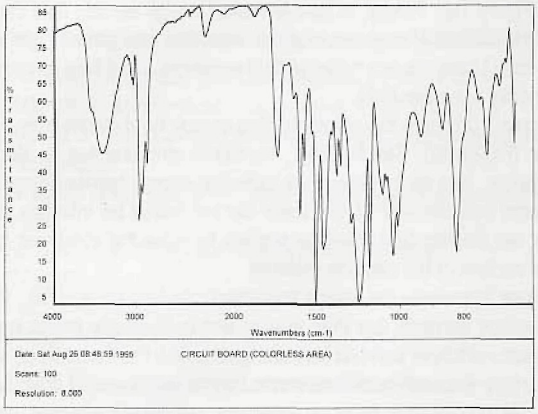

Figure 5

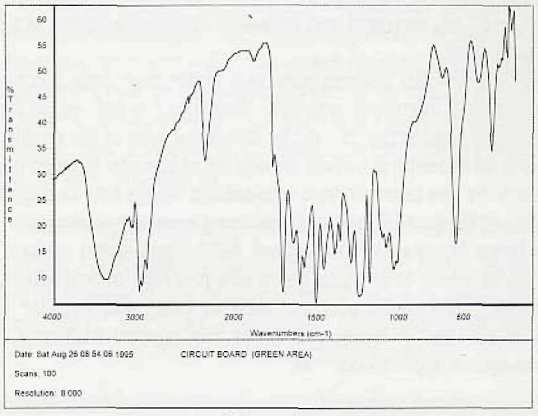

Figure 6