
KRTC Capabilities: Multilayer Structure Analysis

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Structure analysis is a valuable offering of the EVAL TS&D Team. Whether you are looking to validate the layer thickness of a newly developed tub or to match the performance of a film on the market, our analytical team is ready to serve you.

The first step of our multilayer structure analysis is to use a microtome to slice extremely thin (~20 μm) sections of the package. Noting the orientation of the outer surface, the sections are placed on a glass slide and imaged using a high-powered optical microscope, allowing us to measure the thickness of the individual layers present in the cross section. Samples can be treated with iodine, staining polar materials such as EVOH and polyamide red and making them easily identifiable in the cross sections. Alternatively, an unstained sample can be used for hot stage analysis. With this technique, a sample is heated at a controlled rate and the thermal transitions of individual materials in the structure can be observed under polarized light and identified by their melt temperatures. Using optical microscopy techniques, we can identify the total number of layers, can measure the thickness of individual layers, and can predict the materials of composition based on observed melting behavior.

To complement the optical analysis, we also use DSC (differential scanning calorimetry) and ATR-FTIR (attenuated total reflection Fourier-transform infrared spectroscopy) to identify the different polymers used in a multilayer structure. The DSC varies temperature at a controlled rate and energy input is recorded, allowing materials to be identified by known thermal transition temperatures (such as melting); it can even determine the mol% ethylene of EVOH. ATR-FTIR measures the intensities of different wavelengths of light reflected from the surface polymers on the inner and outer surfaces of the

package, providing a chemical fingerprint that can be matched to a library of known polymer materials.

Providing such analysis to our customers is not as simple as following a set of instructions! The EVAL TS&D team employs two analytical research assistants that have honed these skills over many years to provide reliable data to our customers in a timely manner.

Check back in future newsletters as we continue to highlight the capabilities available to our customers at the Kuraray Research and Technical Center. From films to bottles and everything in between, we are dedicated to help you design and produce multilayer EVAL™ EVOH packaging.

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