Application Note AN-RS-007

Identification of various polymer masterbatches

Masterbatches offer an inexpensive opportunity for dyeing plastics during the manufacturing process or to influence various properties of the basic plastic. Measurements of masterbatches with the handheld Raman spectrometer Mira M-1 require no sample preparation and provide immediate results that identify the masterbatches unambiguously, no matter whether they are intended for dyeing or for modifying the basic plastic.

INTRODUCTION

Today's industry, but also daily life, cannot be imagined without polymers, why also polymer masterbatches play an important role in polymer manufacturing.

Generally speaking, polymer masterbatches allow us to endow plastics with special properties. Some widespread additive masterbatches make plastics resistive against UV radiation, antistatic, or antifogging. Masterbatches are not only added to change the polymers' physical and chemical properties; there are also masterbatches that are used to color the polymer during the manufacturing process.

In this study, a library of color masterbatches was built and subsequently used for the identification of unknown masterbatches.

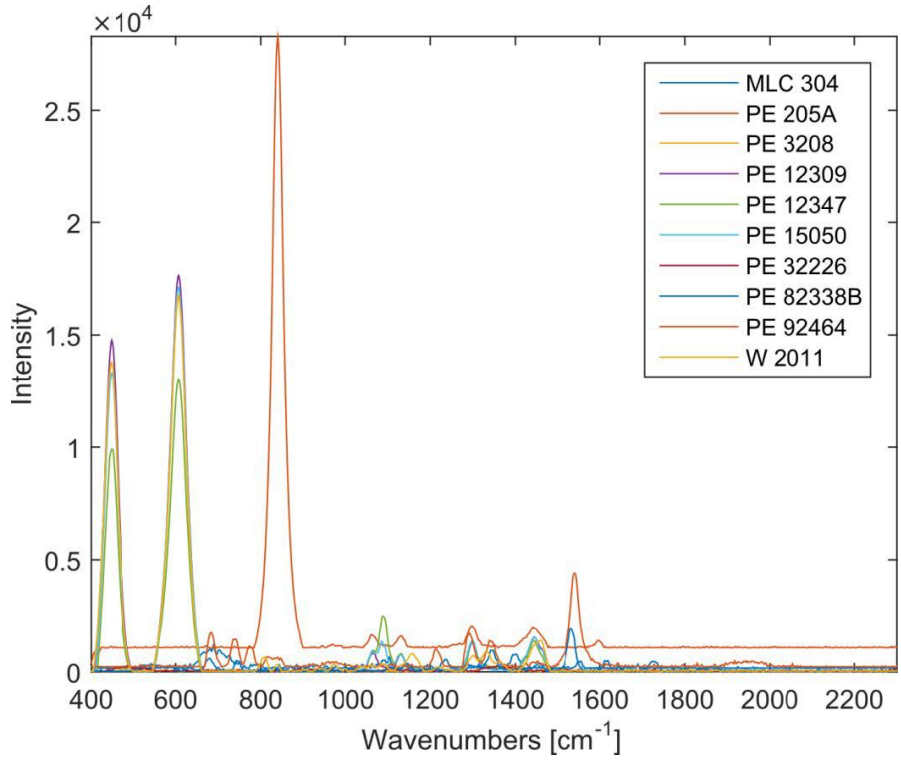

Figure 1. Full Raman spectra of different masterbatches

EXPERIMENTAL

All spectra were measured using the Mira M-1 handheld Raman spectrometer in auto-acquisition mode, i.e., integration times were determined automatically. A laser wavelength of 785 nm and the Orbital-Raster-Scan (ORS) technique were used. Some of the color masterbatches were filled into vials and analyzed using the vial holder attachment, while other samples were analyzed directly in their plastic container using the long working distance (LWD) lens. The following samples were used in this study:

Sample name	Meas. mode	Usage / color
PE 12309	vial	Multilayer film white
PE 12347	vial	color masterbatch white
PE 15050	vial/LWD	color masterbatch white
W 2011	vial/LWD	color masterbatch white
MLC 304	vial	color masterbatch red

PE 205A	vial/LWD	color masterbatch yellow-orange
PE 92464	vial/LWD	color masterbatch green
PE 82338B	vial	color masterbatch blue
PE 3208	vial	injection molding black
RE 32126	vial	color masterbatch black

RESULTS AND DISCUSSION

To build the library, the samples were measured in vials. Using the Mira Cal software, a qualitative differentiation of the spectra was achieved (see Figure 2), although the two black samples PE 3208 and RE 32126 could not be analyzed, because the laser light was absorbed completely.

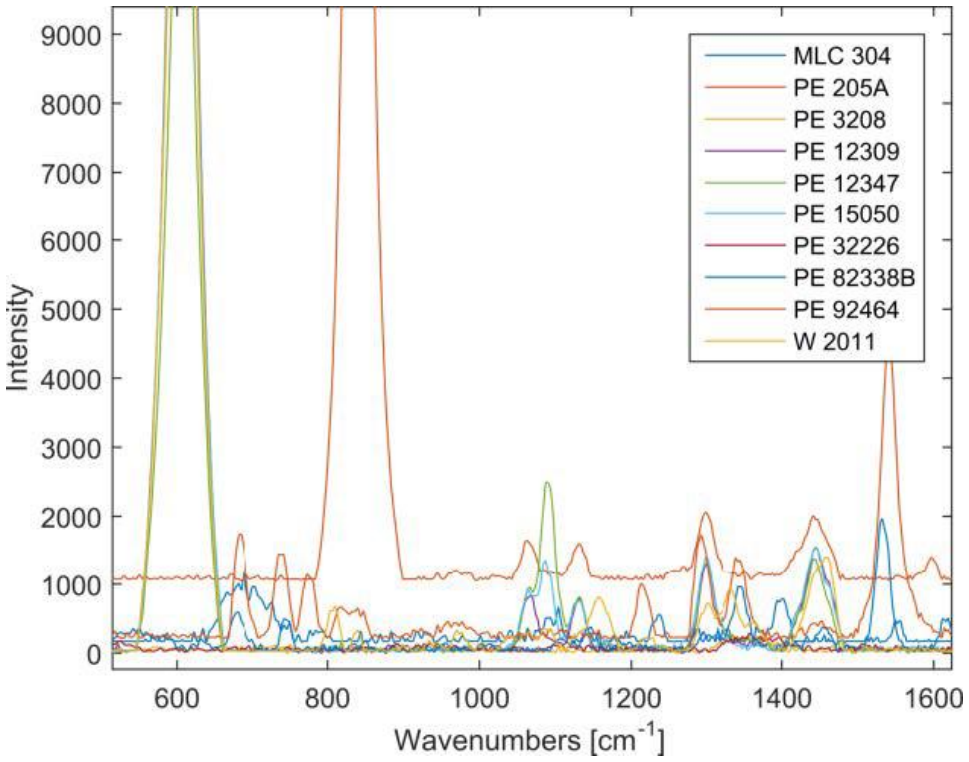

Figure 2. Spectral differences between the masterbatches.

When using Mira in its autonomous mode, i.e., without the use of the Mira Cal software, secure identification of the masterbatches was also achieved. However, small influences of the plastic container of the masterbatch were observed.

CONCLUSIONS

This study shows that Mira M-1 can be used to unambiguously identify polymer masterbatches (color) of different colors by measuring their spectra and matching them with a library. The identification takes just a few seconds.

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