

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.

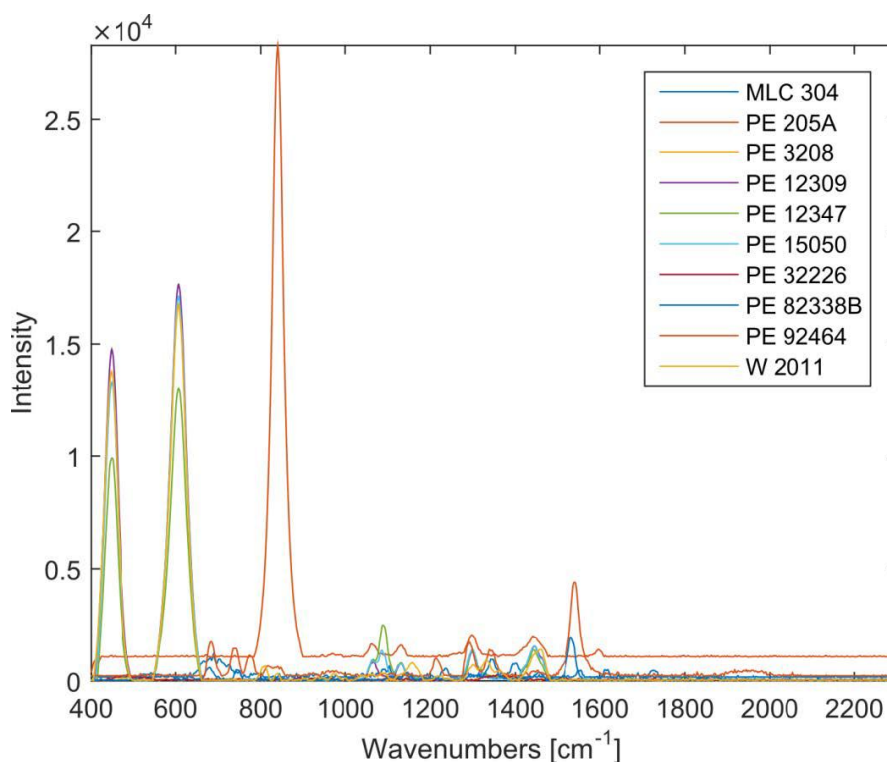


Figure 1. Full Raman spectra of different masterbatches

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.

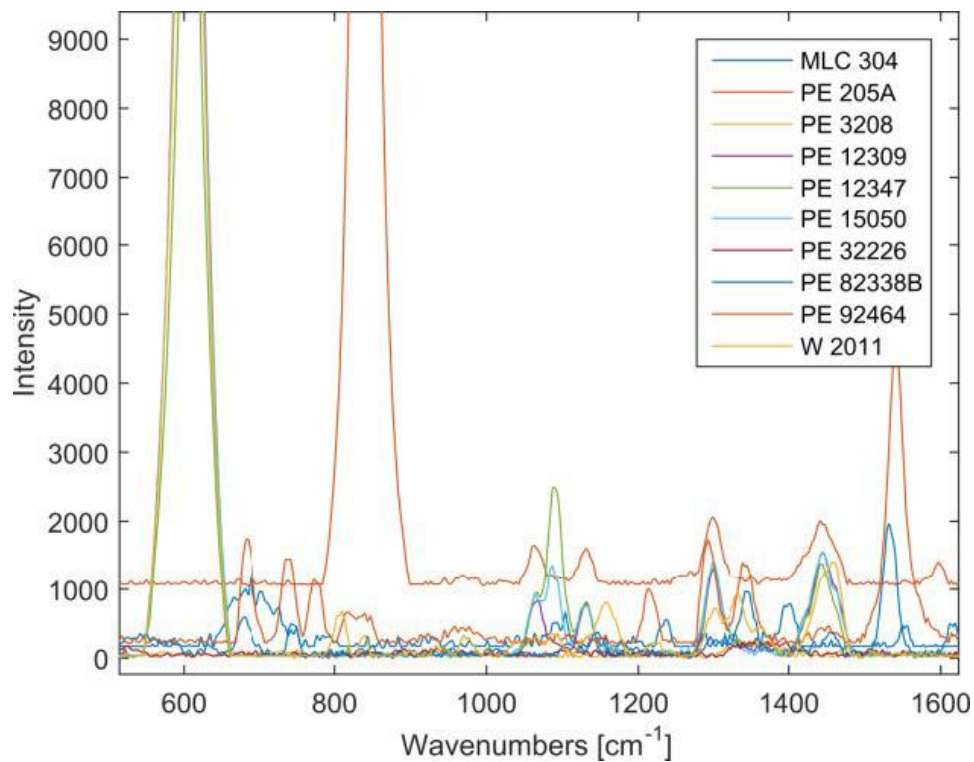


Figure 2. Spectral differences between the masterbatches.

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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CONFIGURATION



MIRA P Advanced

Der Metrohm Instant Raman Analyzer (MIRA) P ist ein leistungsstarkes Raman-Handspektrometer, das für eine schnelle zerstörungsfreie Bestimmung und Verifizierung verschiedenster Materialien, z. B. pharmazeutische Wirkstoffe und Arzneimittelträger, eingesetzt werden kann. Trotz seiner geringen Grösse ist der MIRA P sehr robust und verfügt über eine hocheffiziente Spektrographkonstruktion, die mit unserer einzigartigen Orbital-Raster-Scan-Technologie (ORS) ausgestattet ist. MIRA P erfüllt die FDA-Vorschriften 21 CFR Part 11.

Das Advanced Package umfasst eine Aufsatzlinse, mit der Materialien direkt oder in ihren Gebinden analysiert werden können (Laserklasse 3b), sowie einen Vial-Halter-Aufsatz zur Analyse von Proben, die sich in Glasvials befinden (Laserklasse 1).