mIRoSpark – Combined Device for Plastic Identification

High level material plastic recycling demands that plastic materials must be **sorted** according to **various types**. A **combination of mobile Near Infrared optic (mIRo) and a Sliding Spark Spectrometer (SSS2)** is now combining the benefits of both technologies in one portable unit.

With this technology combination **practically all common types of plastics, regardless of color, size, structure** (films, foils, granules, solid, foamed, carpets and textiles) can be identified together with their additive elements like **fire retardants** and **heavy metals.** For sample preparation to remove dust and dirt or paintings the sample surface can be easily cleaned by scratching with a knife.

The basic principle of the NIR technology is the diffuse reflection spectroscopy whereby characteristic absorption behaviors of different polymer types are used in that spectral region. The polymer sample is radiated with a infrared light and the reflected light of the measuring place is analyzed using a near infrared detector array. **The basic principle of the Sliding Spark technology** is the thermal vaporization of a small amount of the plastic surface using a train of defined high-current sliding sparks. The material components in the spark plasma are vaporized, atomized and activated to emit radiation.


For **plastic identification** one of the measuring pistols is simply pressed on to the analysis sample. The measurement begins by pressing the start button on the pistol grip. After one second an integrated color TFT-screen displays the recognized polymer. The measuring pistols are connected with a 2 m cable each to the instrument. The optical signals are transported via fiber cable to the spectrometer systems. Parameter settings can be set by using an integrated touchscreen. Additional connections like an USB-interface allow data transfer. An integrated **Mini-Plotter** prints out the result. (Dimension in mm: 364 x 200 x 376, weight: 14 kg, power supply: 100V, 100C, 230 VAC, 50/60 Hz).

Identification of different plastic types is the result of a trained pattern recognition. After the measurement of the plastic sample the optical information are processed by a neural network. The result of the calculation is a list of the most probable polymer type identified within a probability of 0 and 100%.

Additive detection is performed by the characteristic atomic emission for an element of the additive in the optical spectra. The intensities of defined spectral lines are compared with preset threshold values. An element is detected if the pre-set threshold value is exceeded. After calibration with known samples, the system enables semi-quantitative analysis of inorganic contents in the sub-% concentration range.
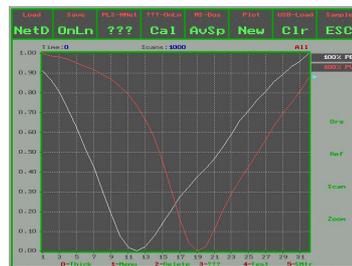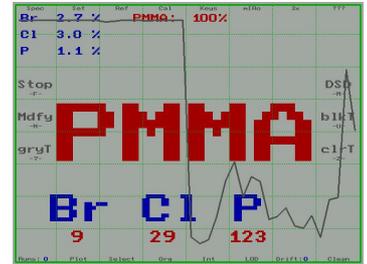
The software allows detailed spectra viewing, loading, saving and editing. The setting of different measuring parameters as so as the possibility to display the resulting spectra easily allows to develop own applications.

With the **mIRoSpark** it is possible to analyze **independently of surface structure, contamination** and **colours** the following relevant plastics, mixtures and additives:

PA6/PA66, PA12, PE, PP, ABS, PS, PPO, SAN, PC+PET, PC, PC+ABS, PBT, PET, PMMA, POM, ABS+PVC, PVC, PE+PA, PE+PET, PP+PET, PLA, Cellulose, PTFE, PPS, SK

- ✓ **Identification of black plastics with the SSS2-part**
- ✓ **Detection of significant halogen-containing fire retardants and heavy metal containing additives**
- ✓ **non-destroying measurement with the mIRo-part**
- ✓ **Less than 1 sec. measuring time**
- ✓ **On site analysis e.g. in disassembling areas**
- ✓ **Measurement of foils and granulates possible**
- ✓ **Identification of plastics from household- and electronics waste as well as carpets and textiles**
- ✓ **Detailed spectra overview for easy evaluation**
- ✓ **8 additional materials/spectra can be added**
- ✓ **Printout the identification result**

According to different demands in recycling matters, customers can arrange to have the **system calibrated using their own samples**.