

## REPORT

### **Upgrade of GC/MS with Pyrola® 2000 pyrolyzer for widening the analytical capabilities of TFNS towards determination of microplastics**

In accordance with the work plan of the TwiNSol-CECs project, “*Pyrola® 2000 pyrolyzer*” was procured with an aim to upgrade an existing gas chromatography-mass spectrometry (GC/MS) instrument and in this way to broaden the range of compounds of emerging concern that can be analyzed at TFNS towards microplastics (MPs) determination. The GC/MS system available at the Lab for Chromatography at TFNS is *Agilent 7890B GC* with *Agilent 5977A MS*. Upon receiving the pyrolyzer at the Lab, the installation and training session were agreed with the Agilent distributor for Serbia (DSP Chromatography d.o.o., Belgrade) and organized at the Lab on Jan 17-18, 2023.

So far, GC/MS has been used for target/screening analysis of different volatile and semi-volatile organic compounds (terpenes, persistent organic pollutants, pesticides, phthalic acid esters, etc.). Analysis of MPs in environmental samples represents a significant challenge. Pyrolysis gas chromatography-mass spectrometry (Py-GC/MS) is a common technique used in polymer science including analysis of environmental samples to get quality and quantity information regarding the presence of MPs. Py-GC/MS can be used to identify and quantify commonly used polymers that make MPs, i.e. polyethylene - PE, polypropylene - PP, polystyrene - PS, polyvinyl chloride - PVC, polyamide - PA, polymethyl methacrylate - PMMA, Polycarbonate - PC, and polyethylene terephthalate - PET.

In general, *Pyrola® 2000* pyrolyzer offers opportunities for analysis of non-volatile samples by making them volatile by heating a sample in an inert atmosphere so the large molecules are divided into smaller more volatile fragments. The *Pyrola® 2000* system consists of the process unit, control unit, optic cable, control cable to the processing unit, communication cable, main power cable, and computer with *Pyrola® 2000* software.

The pyrolyzer was successfully installed at TFNS (Figures 1-2) by Helena Jönsson, an authorized service engineer of the company PYROLab (Lund, Sweden) and Mladen Perišić, an authorized service engineer of DSP Chromatography d.o.o. (Belgrade, Serbia).



**Figure 1.** *Pyrola® 2000 pyrolyzer (left) and its installation on GC/MS at the Lab for Chromatography at TFNS*



**Figure 2.** *Installation of Pyrola® 2000 pyrolyzer*

After the software installation, a detailed introductory training was provided by Helena Jönsson, who demonstrated the main hardware and software tools (Figure 3), including:

- Detailed explanation of all *Pyrola® 2000* unit
- Connection and disconnection of the *Pyrola® 2000* unit from the GC system
- Description and usage of the software
- Application of different pyrolysis techniques: isothermal desorption, sequential pyrolysis, fractionated pyrolysis, and pyrotomy
- Analysis of real samples
- Maintenance of the *Pyrola® 2000* unit

The upgraded instrument, Py-GC/MS, is labeled with TwiNSol-CECs sticker (Figure 4); further training sessions within TwiNSol-CECs, dealing with MPs analysis by Py-GC/MS are expected to be agreed with CSIC partner.



**Figure 3.** *Introductory training on Pyrola 2000 for TFNS team members from the Lab for Chromatography provided by Helena Jönsson, an authorized service engineer of the company PYROLab (Lund, Sweden)*



**Figure 4.** Pyrola 2000 process unit installed on the (top of) existing GC/MS instrument at TFNS with the Pyrola control unit (on the left) labeled with TwiNSol-CECs sticker

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