

CASE STUDY

Applying chemometric methods to pyrolysis processes



Marcin Sajdak of the Institute for Chemical Processing of Coal in Poland visited the European Bioenergy Research Institute (EBRI), Aston University in the UK.

Below is a summary of his BRISK experience

I am an assistant professor at the Institute for Chemical Processing of Coal (ICPC) in Poland and a member of the Small-Scale Thermal Processing and Analysis Group. This team specialises in thermal conversion technologies (torrefaction, pyrolysis, gasification) for both solid fuels and waste. My main interest is to apply a wide range of chemometric methods to gain an in-depth understanding of the pyrolysis and co-pyrolysis processes of biomass and plastic waste. Chemometric methods allow the identification and description of important processing factors and parameters influencing the processed products obtained. It also develops new analytical procedures to identify the origin of materials (fuel) produced during particular thermal conversion processes.

The growing amount of plastic waste produced globally every year is a major technological and scientific challenge. The research I conducted through BRISK at EBRI involved the qualitative analysis of products from thermal conversion of biomass and waste polymeric materials, with the chosen catalyst, which would help show the way they process. In addition, the char obtained during the biomass and plastic blends co-pyrolysis process was tested at a high temperature (1000°C) decomposition process using the Pyrolysis Gas Chromatography Mass Spectrometry method (Py-GC-MS).



Figure 1: Preparation of a sample for Py-GC-MS analysis.

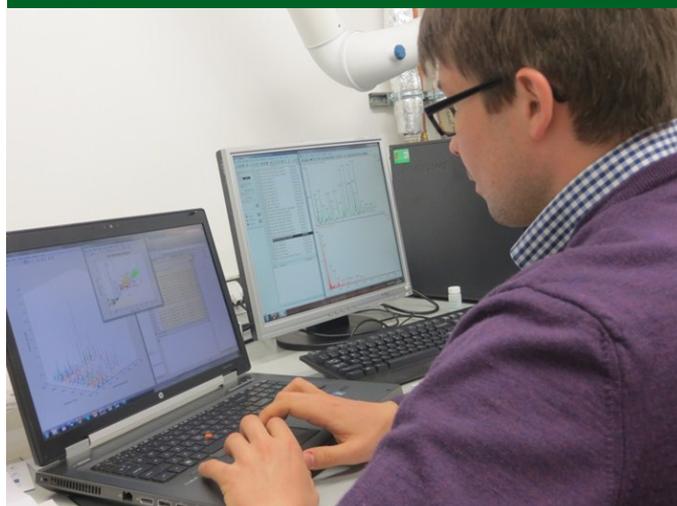


Figure 2: Data processing.

The main objective of the BRISK research I carried out at Aston was to study catalytic co-pyrolysis of biomass, lignin and lignin-rich materials with waste polymers. For my research I used pine wood, beech wood, polypropylene, poly(ethylene terephthalate) and acrylonitrile butadiene styrene as feedstock. In addition, char samples prepared at my home institute were analysed using analytical pyrolysis (Py-GC-MS).

Continued on next page

CASE STUDY

Applying chemometric methods to pyrolysis processes...continued

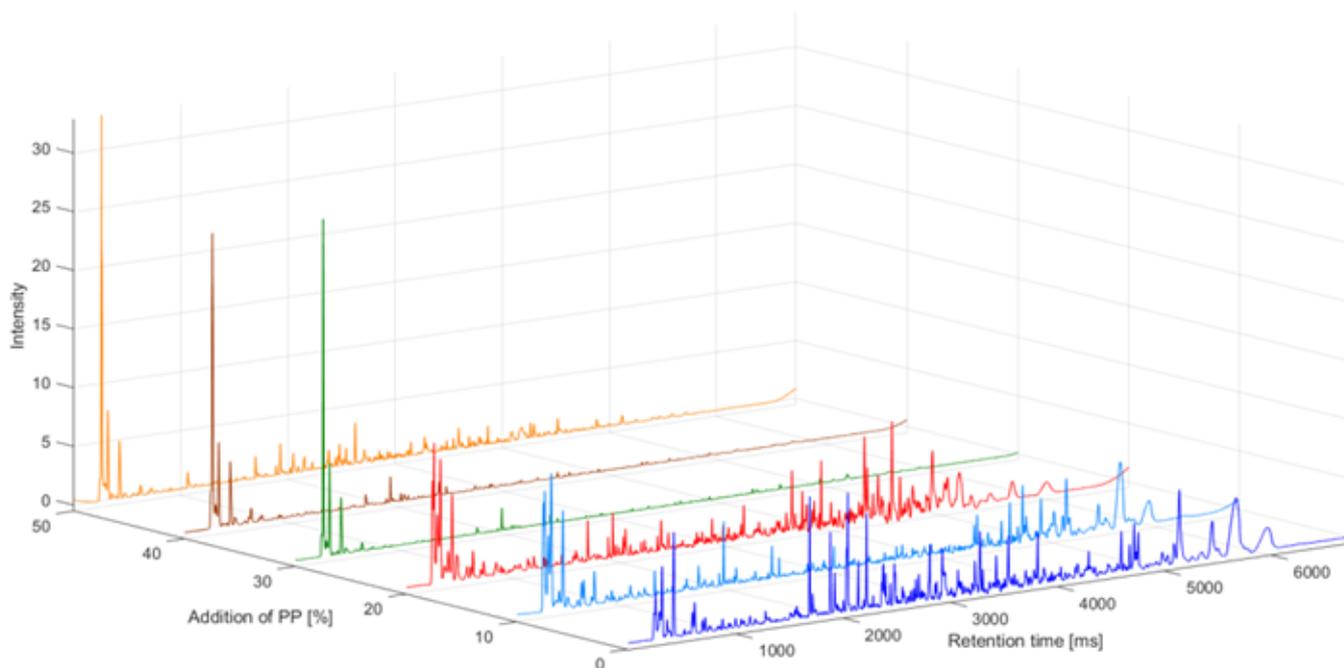


Figure 3: Chromatograms from the pyrolytic decomposition of polypropylene-biomass chars prepared at 550°C and pyrolysed at 1000°C.



Figure 4: In front of the EBRI building with Dr Daniel Nowakowski.

Multi-dimensional analytical data obtained from the Py-GC-MS analysis is used for comparative analysis using chemometric methods. This analysis allowed enough data to be obtained to propose a depolymerisation mechanism of waste polymeric materials, and to determine the effect of the used catalyst in the radical reactions involved.

Participation in the BRISK project allowed me to become acquainted with very useful analytical techniques, which I plan to apply to my future research work.



www.briskeu.com

Contact

Tony Bridgwater
Aston University
E: a.v.bridgwater@aston.ac.uk
W: www.aston.ac.uk/eas/research/groups/ebri/