



# WE BROKE THE BOTTLENECK OF MICROPLASTICS ANALYSIS

## Nostra Culpa, we did it.

But why was there a bottleneck in the first place? And how did it happen? Well ...

There are many methods to analyze microplastics, but some carry more of the workload than others. **IR imaging**, for instance, has been one of the powerhouses and driving forces of microplastics analysis for the last decade.

With IR imaging, microparticles are not only characterized by size and shape but also by their chemical makeup. This enables you to obtain valuable information regarding their origin, characteristics, and impact.

Countless publications have analyzed contamination in the air we breathe, the water we drink, and the soil we grow our food in using IR imaging. This research, besides requiring expert knowledge for sample preparation, shares one common ingredient: **time**.

Because analyzing whole filters by IR imaging requires a lot of time. One part is the measurement itself, but this can and has been automated. The remaining bottleneck came from the immensely large datasets produced.

We're talking **terabytes of data for a single publication**.

The sheer size alone has a massive impact on computer hardware, and the algorithms used since 2015 are not equipped to reliably and quickly analyze this enormous data treasure.

However, developments over the last three years have brought a new approach to data analysis.

It might sound like a buzzword from meeting rooms or marketing documents, but **AI**, when applied by experts and trained by professionals, is an immensely powerful ally for data analysis and streamlining.

This year, Bruker has launched "MPID", the **MicroPlasticsIdentifier**, a software tool for accurate, efficient, and regulation-aligned microplastic analysis using IR imaging and artificial intelligence.

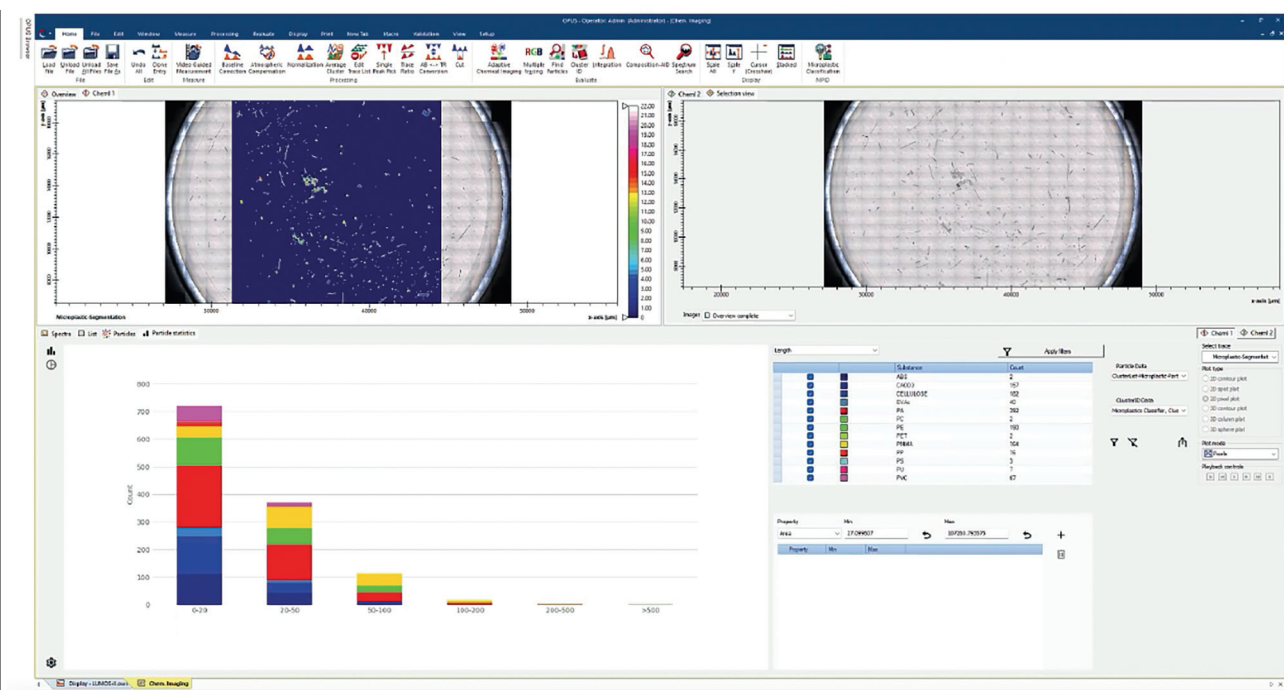


Figure 1: IR imaging analysis of a microplastics sample, including bar chart showing particle statistics.

How does it work? The exact mechanism is explained in detail in our product note (downloadable at the end of this article), but here's the abridged version:

The MPID classification pipeline processes hyperspectral images through a series of automated steps and deep neural network classification.

Sounds complicated, but actually, it is indeed quite an easy concept.

Hyperspectral images are what we call the IR data collected during IR imaging. Each pixel in such an image is directly linked to an IR spectrum.

The algorithm examines every spectrum in every pixel and classifies it according to a defined ruleset:

- First, each spectrum undergoes **spectral standardization**.
- Then, a neural network determines the presence of relevant material by distinguishing foreground pixels from the background.
- Next, a second algorithm classifies each foreground pixel into a polymer class (e.g., ABS, PE, PET, you name it).
- Finally, each pixel is labeled based on surrounding spatial context, creating smooth and continuous chemical maps of the measured microplastics.



Marker	ID	Area [µm <sup>2</sup> ]	Width [µm]	Length [µm]	On Boundary	Load Cluster	Substance	Identified	Fiber	Particle fiber size	
✓	566	107260.79	524.19	519.80	False		PE		716.00	True	115.98
✓	511	81177.54	662.79	325.46	False		PE		832.00	True	134.18
✓	398	69551.73	401.35	251.21	False		PA		871.00	False	234.38
✓	560	34484.71	388.79	193.45	False		PE		713.00	True	105.04
✓	557	33400.27	435.96	159.69	False		PE		691.00	True	115.01
✓	570	28603.65	395.59	146.99	False		PE		718.00	True	110.94
✓	104	26828.71	243.13	167.25	False		PA		927.00	False	149.73
✓	911	21517.24	288.40	111.81	False		FS		910.00	False	96.63
✓	726	21463.10	248.89	200.79	False		PMMA		913.00	True	61.11
✓	231	21354.65	219.60	148.16	False		PA		912.00	False	136.70
✓	157	21124.41	604.44	57.61	False		PA		790.00	True	52.06
✓	399	20365.36	555.08	60.39	False		PA		775.00	True	46.32
✓	66	20040.43	631.33	103.61	False		PA		851.00	True	54.78
✓	225	18468.54	161.13	151.20	False		PA		926.00	False	128.81
✓	704	15053.86	203.74	108.01	False		PMMA		889.00	False	98.27
✓	197	14931.89	440.94	51.95	False		PA		746.00	True	47.11
✓	43	14511.87	177.06	137.96	True		PA		918.00	False	105.70
✓	176	14308.64	335.31	60.04	False		PA		720.00	True	52.87
✓	391	14268.02	442.98	60.53	False		PA		853.00	True	47.25
✓	397	14254.57	452.80	52.49	False		PA		779.00	True	44.28
✓	192	13360.14	312.92	67.88	False		PA		736.00	True	52.87
✓	122	13197.66	360.61	55.99	False		PA		882.00	True	48.21
✓	205	13116.23	319.21	62.72	False		PA		802.00	True	52.16
✓	407	12127.22	247.56	102.89	False		PA		755.00	True	69.69
✓	303	11923.88	323.01	58.10	False		PA		801.00	True	50.41
✓	727	11720.71	193.88	95.58	False		PMMA		973.00	False	82.10
✓	692	11314.24	218.79	88.91	False		PMMA		935.00	True	72.19
✓	517	11260.01	222.13	82.60	False		PE		809.00	True	67.27
✓	245	11232.91	295.66	67.86	False		PA		781.00	True	40.52
✓	697	10948.33	157.27	104.66	False		PMMA		919.00	False	85.28
✓	707	10623.18	195.09	109.35	False		PMMA		921.00	False	84.61
✓	216	10392.82	307.11	76.67	False		PA		745.00	True	42.40
✓	336	10379.16	338.24	52.25	False		PA		740.00	True	44.63

Figure 2: List of particles found and their identity, shape, and size acquired by MPID.

Let me be clear: **This is not a black box.**

This is a software tool that helps experts see clearer, faster.

Now IR imaging devices can run on auto, acquiring data 24/7, and users can finally keep up with the data, breaking it down into results in minutes and tackling the growing microplastics problem.

That's how and why we broke the bottleneck.

By eliminating manual evaluation and external processing, MPID accelerates time-to-result and ensures consistency across large-scale studies.

Want to learn more? Download our Product Note.

Questions? Contact us

**Dr. rer. nat. Simon Hugo Schlindwein**  
**Application Expert – Bruker Optics**  
 Email: [marketing-hopt.de@bruker.com](mailto:marketing-hopt.de@bruker.com)  
 Web: [www.bruker.com](http://www.bruker.com)

**READ, SHARE or COMMENT**  
 on this article at:  
[envirotech-online.com/article](http://envirotech-online.com/article)

