

WHAT DO YELLOW TRASH CONTAINERS HIDE?



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We do not know whether recycling will save us from environmental disaster. However, we do believe that segregating waste makes sense. From an early age, our children learn to associate the colors of the bins with different types of waste. Plastic bags and bottles, metal caps, aluminum cans, or milk cartons end up in yellow containers and bags every day. These few examples already show the diversity of these materials. There are as many as seven codes for marking only plastics, in accordance with the Resin Identification Code (RIC) introduced in 1988. Therefore, our segregated waste needs to be sorted once again before proper recycling is possible. How is this accomplished? It turns out that an appropriately designed camera is everything that is necessary.

We buy paper straws for drinks, cutlery made of avocado seeds, and plates made of bran. We can already purchase recycled clothes, and our body has become used to materials containing artificial additives, such as polyester, acrylic, or nylon. Filtering bottles and siphons are a great alternative to the billions of tons of water contained in PET bottles. The ecological lifestyle has become fashionable, and the same applies to promoting the idea of less waste – or even zero waste. It is also worth mentioning that countries of the European Union will be required to achieve a recycling level of 65% and composting municipal waste by 2035. This means that more than half of the waste collected will have to be given a second, third, or even fourth life. Despite so many changes, predictions related to the approaching environmental disaster are not particularly optimistic. The production of plastics in the world is growing. Billions of tons of polymer waste end up in the oceans, and scientists are wondering to what extent the microplastics permeating the human body pose a threat to our health and quality of life.

The Plastic Waste Makers report available on the website of Minderoo Foundation (www.minderoo.org) shows, among others, that only slightly more than a dozen corporations are responsible for over half of the amount of polymers produced annually on our planet. The two world powers, China and the USA, are by far the leaders of

this “competition”. However, every one of us is responsible for the state our world has found itself in, as it drowns in a sea of waste. We consistently separate waste, however, it is due to our consumer choices that the yellow bins are filled to the brim with colored plastic every day.

The floor must therefore be given to scientists who have already emphasized the importance of recycling at the design stage of new materials and continue to propose increasingly effective methods of dealing with the billions of tons of waste flooding us. The task is by no means easy. Polymers, mainly due to their very interesting properties, are still massively used in the production of most of the objects surrounding us – in clothes, cars, smartphones, and they work well in every industry. Moreover, they are not easily recycled. Their list is open, since new combinations of chemical compounds are constantly being created, and in the process of recovering these materials, the identification of individual elements from which they were built is of crucial importance. In practice, this means that the contents of yellow containers must be segregated again.

An interesting solution was proposed by scientists from the University of Silesia in Katowice – Prof. Michał Daszykowski and doctorate student Łukasz Pieszczyk. Their approach resorts to the hyperspectral imaging method, which, according to research, allows for efficient and fast identifica-

tion of certain groups of plastics.

“What makes various types of polymers different is their unique electromagnetic spectrum. We could compare it to fingerprints that enable us to identify an individual,” says Prof. Michał Daszykowski.

Therefore, let us imagine that we are in a waste sorting plant. On the conveyor belt, tons upon tons of products collected daily in yellow bins are moving. It suffices to install a special camera that will record the hyperspectral image of every point of a given object. Not only this tell us whether we are dealing with polyethylene, acrylic, acrylic glass, polypropylene, etc. but also provide us information about possible contaminants. The described method allows for automatic segregation of plastics, which in turn can significantly accelerate and facilitate the recycling process and contribute to a more rational waste management.

“The reality shows that there will be more products made from plastic every year. However, we must learn to recover and reuse them wisely,” argues Prof. Michał Daszykowski.

Scientists from the University of Silesia are currently working on improving the tool to identify individual groups of polymers, and testing its effectiveness in laboratory conditions. They are also ready to establish a cooperation with entities responsible for waste management and interested in introducing and testing the new technology in practice.