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Country Information on Chemicals in Recycled Plastic Pellets from Malaysia

The study was conducted in Malaysia by the NGO Consumers Association of Penang (CAP).

Initial analysis

This data was published in 2021 in the report [Widespread chemical contamination of recycled plastic pellets globally](#).

One sample was analyzed from Malaysia for the presence of 18 chemicals. In total 16 chemicals were detected:

- 9 out of 11 brominated flame retardants
- 6 out of 6 UV-stabilizers
- Bisphenol A

Broader analysis

The results from the broader analysis was published in the data article [A dataset of organic pollutants identified and quantified in recycled polyethylene pellets](#), and the complete dataset is [publicly available online](#). Samples from 13 countries were analyzed, and nearly 500 chemicals were detected in total. These included pesticides, industrial chemicals, PCBs, pharmaceuticals, and many others.

Two samples were analyzed from Malaysia for a wide range of target chemicals. A total of 123 chemicals were detected in the two samples combined. In the first sample (MAL_02G), a total 107 chemicals were detected. In the second sample (MAL_03W), a total of 111 chemicals were detected. 95 of these chemicals were present in both samples.

The 30 chemicals detected at the highest concentrations in each sample are provided below in Annex 2. Out of these 30 chemicals, it can be noted that half were traces from various stages of the production of different types of plastics. These 30 chemicals also included several bioactive substances, including pesticides such as the pesticide chlorpyrifos that is in its final stages of evaluation for listing under the Stockholm Convention, and pharmaceuticals. In addition, they included three Polycyclic Aromatic Hydrocarbons (PAHs).

Conclusion

Both studies provide evidence that recycling of plastics leads to toxic chemicals present in the source materials being mixed and carried over into the recycled plastic. These include intentionally added chemicals, as well as chemicals from the production and recycling process, and contamination of plastic containers from use.

The results indicate that the source material included for example:

- plastics from electronics that contain flame retardants
- containers from various types of pesticides and pharmaceuticals
- containers of personal care products



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Annex 1: Sources of the information for the country information

Link to the report Widespread chemical contamination of recycled plastic pellets globally:

<https://ipen.org/documents/widespread-chemical-contamination-recycled-plastic-pellets-globally>

Link to data article A dataset of organic pollutants identified and quantified in recycled polyethylene pellets:

<https://www.sciencedirect.com/science/article/pii/S2352340923008090>

Link to the complete dataset: <https://zenodo.org/records/8367104>



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Annex 2: The 30 chemicals detected in the highest concentrations

Sample MAL_02G

| No | Compound | Use | Concentration (ng/L) |
|----|----------------------------------|---|----------------------|
| 1 | N-Ethyl-o-toluenesulfonamide | Plasticizer | 16,107 |
| 2 | TMDD | Surfactant | 2,545 |
| 3 | N,N-Dimethyldodecylamine N-oxide | Surfactant | 1,422 |
| 4 | 4-Methylmorpholine-N-oxide | Solvent | 919 |
| 5 | p-Toluenesulfonamide | plasticizer | 604 |
| 6 | Quaternium-15 (free base) | Preservative used in personal care products | 529 |
| 7 | Octocrylene | UV protection | 499 |
| 8 | Lauryl diethanolamide | Personal care and household products | 280 |
| 9 | Diphenylphosphine oxide | Flame retardant | 199 |
| 10 | Lauramidopropylbetaine | Personal care and household products | 191 |
| 11 | DEET | Insect repellent | 191 |
| 12 | Didecyldimethylammonium | Biocide | 139 |
| 13 | Galaxolide | Fragrance | 133 |
| 14 | Azelaic_acid_M+NH4 | Pharmaceutical | 117 |
| 15 | Anthracene | Polycyclic Aromatic Hydrocarbon (PAH) | 109 |
| 16 | Chlorpyrifos | Pesticide | 106 |
| 17 | Phenanthrene | Polycyclic Aromatic Hydrocarbon (PAH) | 97 |
| 18 | Melamine | Plastic component | 87 |
| 19 | Cyclohexylphenylketone | Used in polymer production | 76 |
| 20 | Pyrene | Polycyclic Aromatic Hydrocarbon (PAH) | 64 |
| 21 | Benzophenone-3 | Stabilizer | 63 |
| 22 | alpha-Tocopherol acetate | Cosmetics | 61 |
| 23 | Octyl-methoxycinnamate | UV protection | 59 |
| 24 | Diethofencarb | Pesticide | 53 |
| 25 | Tris(1-chloro-2-propyl)phosphate | Flame retardant | 51 |
| 26 | Ephedrine | Pharmaceutical | 40 |
| 27 | Methenamine | Pharmaceutical | 37 |
| 28 | Benzyl-2-naphthylether | Industrial chemical | 37 |
| 29 | Tri-isobutylphosphate | Solvent | 33 |
| 30 | Tri(butoxyethyl)phosphate | Flame retardant and plasticizer | 27 |



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Sample MAL_03W

| No | Compound | Use | Concentration (ng/L) |
|----|------------------------------------|---|----------------------|
| 1 | N-Ethyl-o-toluenesulfonamide | Plasticizer | 17,178 |
| 2 | Octocrylene | UV protection | 3,249 |
| 3 | TMDD | Surfactant | 1,850 |
| 4 | N,N-Dimethyldodecylamine N-oxide | Surfactant | 982 |
| 5 | p-Toluenesulfonamide | plasticizer | 930 |
| 6 | Galaxolide | Fragrance | 839 |
| 7 | Quaternium-15 (free base) | Preservative used in personal care products | 762 |
| 8 | Anthracene | Polycyclic Aromatic Hydrocarbon (PAH) | 668 |
| 9 | Phenanthrene | Polycyclic Aromatic Hydrocarbon (PAH) | 596 |
| 10 | Pyrene | Polycyclic Aromatic Hydrocarbon (PAH) | 385 |
| 11 | 4-Methylmorpholine-N-oxide | Solvent | 277 |
| 12 | Lauryl diethanolamide | Personal care and household products | 249 |
| 13 | m-Terphenyl | Heat transfer fluid in polymerisation | 223 |
| 14 | Lauramidopropylbetaine | Personal care and household products | 210 |
| 15 | alpha-Tocopherol acetate | Cosmetics | 171 |
| 16 | Diphenylphosphine oxide | Flame retardant | 160 |
| 17 | Melamine | Plastic component | 154 |
| 18 | DINCH | Plasticizer | 135 |
| 19 | Azelaic acid_M+NH4 | Pharmaceutical | 133 |
| 20 | Didecyldimethylammonium | Biocide | 122 |
| 21 | Octyl-methoxycinnamate | UV protection | 121 |
| 22 | Chlorpyrifos | Pesticide | 118 |
| 23 | DEET | Insect repellent | 110 |
| 24 | Tonalide | Fragrance | 107 |
| 25 | 2,2-Dimethoxy-2-phenylacetophenone | Stabilizer | 107 |
| 26 | trans-a-Methylstilbene | Curing agent for epoxy resin | 86 |
| 27 | Benzophenone-3 | Stabilizer | 75 |
| 28 | Diglyme | Solvent | 72 |
| 29 | 2-Acetonaphthone | Fragrance | 60 |
| 30 | Cyclohexylphenylketone | Used in polymer production | 58 |