

Analysis of Recycled Polypropylene

~ Odor analysis ~

Recycled polymers may contain low molecular weight impurities as the degraded products of polymer and additive. Those low molecular weight compounds can cause odors. In this technical report, we introduce the cause analysis of the odor in recycled polypropylene (PP).

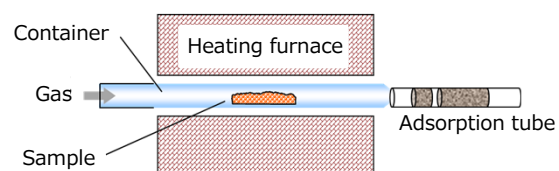
Sample

Sample	Detail	Color	Sensory test
Virgin PP	Block PP	White	Resin smell
Recycled PP	Low grade. Post-consumer. Talc and CB	Black	Fresh smell Oil smell

Pretreatment

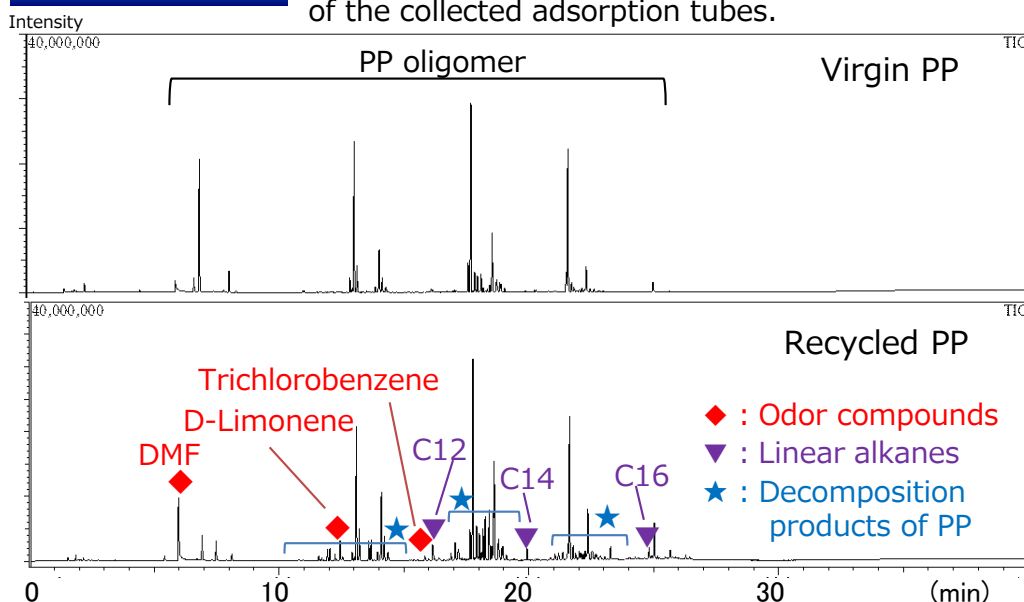
Sample weight: 3 g
Heating temperature: 40°C
Heating time: 2 hours

Image

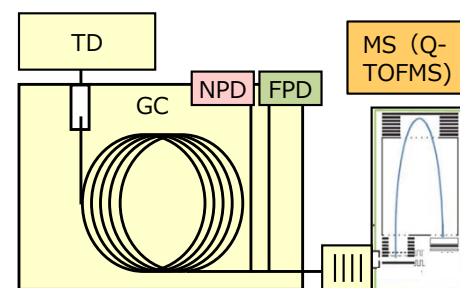


GC/MS analysis

Qualitative analysis was performed by thermal desorption (TD) GC/MS measurement of the collected adsorption tubes.



GC/MS instrument (NPD+FPD)



NPD : Nitrogen Phosphorus Detector
Selected detection of N, P

FPD : Flame Photometric Detector
Selected detection of S

Cause analysis of odor

Identify of the chemicals that cause odor was carried out from the amount of each compound and smell information.

Detected compound	Amount of generated gas (ng/g)		Information of compound smell		Degree of contribution*	
	Virgin PP	Recycled PP	Threshold	Type of smell	Virgin PP	Recycled PP
N,N-Dimethylformamide(DMF)	68	240	1.8 ppm	Amine-like	38	133
D-Limonene	—	38	0.038 ppm	Fruity, Mint-like	—	1000
Trichlorobenzene	—	12	1 ppm	Aromatic	—	12
Linear alkane(C12, C14, C16)	—	88	0.11 ppm (C12)	Oil-like	—	800

* Amount of generated gas / Threshold

➔ Main cause of odor: D-Limonene and Linear alkane

※D-Limonene...Derive from perfume
Linear alkane...Derive from oil

By using high-resolution GC/MS, NPD and FPD combined with database of smell and multivariate analysis, identification of odor-causing compounds in recycled polymers is possible.