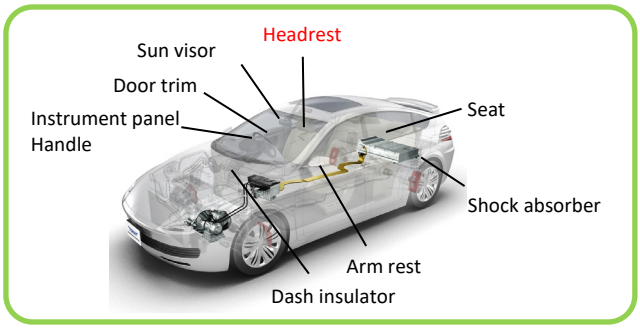
Analysis of the gases generated in a car fire

Automobile interior materials are almost organic, so qualitative and quantitative analyses of the gases generated in a car fire are very important as one of the safety evaluation of the automobiles. We can analyze combustion gases based on JIS K 7217, analytical method for determining gases evolved from burning plastics, and more various conditions similar to a real car fire.

Automobile interior materials

Various organic materials are used in the interior of automobiles.
- Cushioning material of the headrest・・・Polyurethane
- Cover of the headrest・・・Polyester
- Instrument panel・・・ABS
- Seatbelt・・・Nylon etc.

⇒Different combustion gases are generated from different materials. Some of these gases may be harmful.



Conditions of combustion test

●JIS K 7217:Analytical method for determining gases evolved from burning plastics

Condition	Temp.	Atmosphere (Combustion-supporting gas)	Gas flow	Mass of sample	Ignition method	Time
A	750±10℃	Air	0.50±0.05 L/min	0.1 g	Spark while the combustion	10 min
B			1.50±0.05 L/min			5 min

●Various conditions of combustion

Temp.
r.t.～950℃

×

Atmosphere (Combustion-supporting gas)
Air
N_2
He

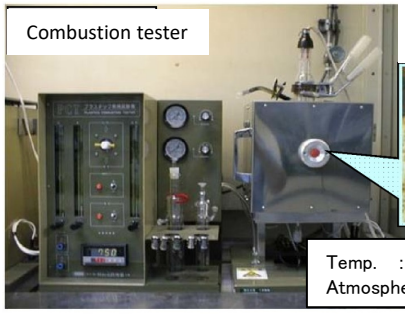
×

Ignition method
Spark (Model of flash ignition)
Heating wire (Model of ignition)

= ∞

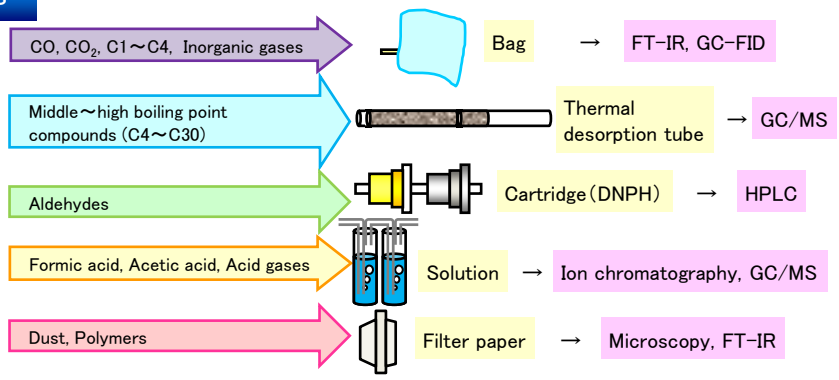
Combination of some conditions can simulate various combustions

Combustion tester and analytical methods

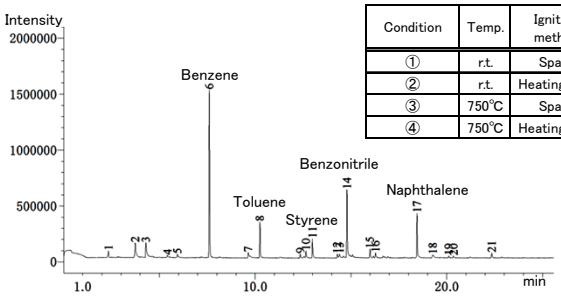


Appearance of combustion

Temp. :～950℃
Atmosphere : Air, N_2, He



Example of GC/MS result of the combustion gases of the cushioning material of the headrest



GC/MS result of the combustion gases of the cushioning material of the headrest (condition④)

Condition	Temp.	Ignition method	Model of combustion	Amount generated from the sample (μg/g)			
				Benzene	Ethylbenzene	Xylene	Styrene
①	r.t.	Spark	Flash ignition in the initial stage	–	–	–	–
②	r.t.	Heating wire	Ignition in the initial stage	150	47	–	200
③	750℃	Spark	Flash ignition in the middle and final stages	1800	–	–	–
④	750℃	Heating wire	Ignition in the middle and final stages	1300	64	32	110

These analyses of the gases generated in various combustions, such as initial, middle stage, and incomplete combustion, provides us with detail information of the gases generated in a car fire.

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