

# Flame Retardant Technology of Automotive and Fire Safety in Japan

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# The Society of Flame-Retardant Material

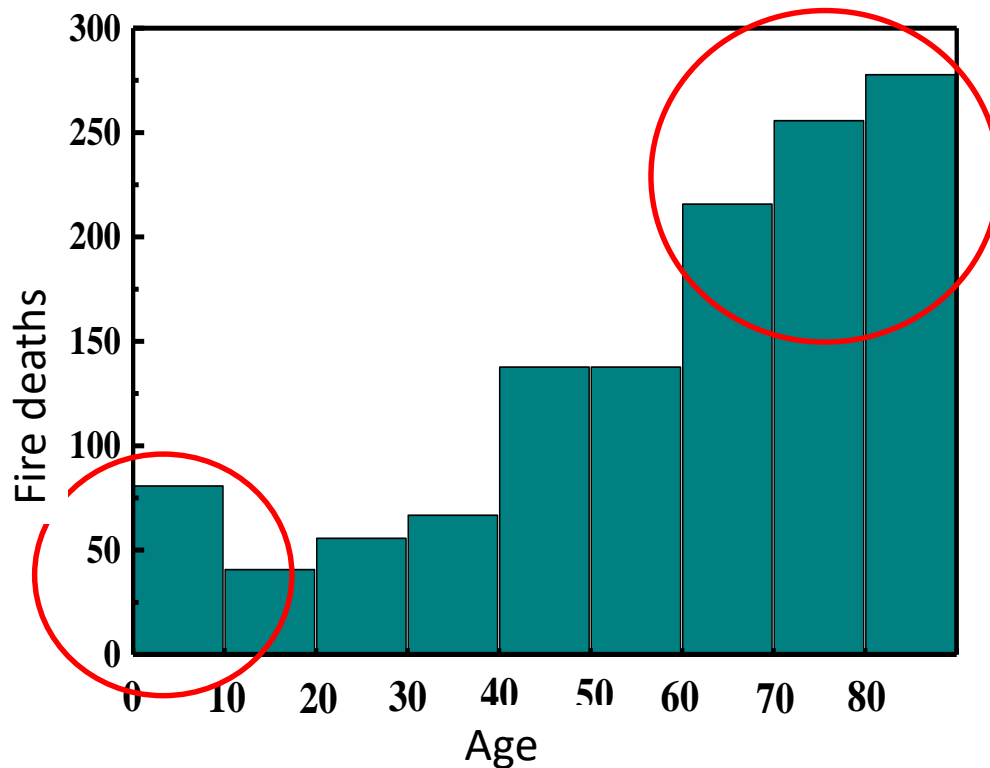
## ➤ Objective

1. Sharing technical information (product introduction, academic research, regulation, environment)
  2. Research on Flame Retardant Technology (Mechanism of Combustion Phenomena, New Field)
  3. Member intercommunication (holding symposium, issuing books)
- Number of members: approximately 500,
  - Sponsored companies: About 250

# Purpose of Flame Retardant Materials

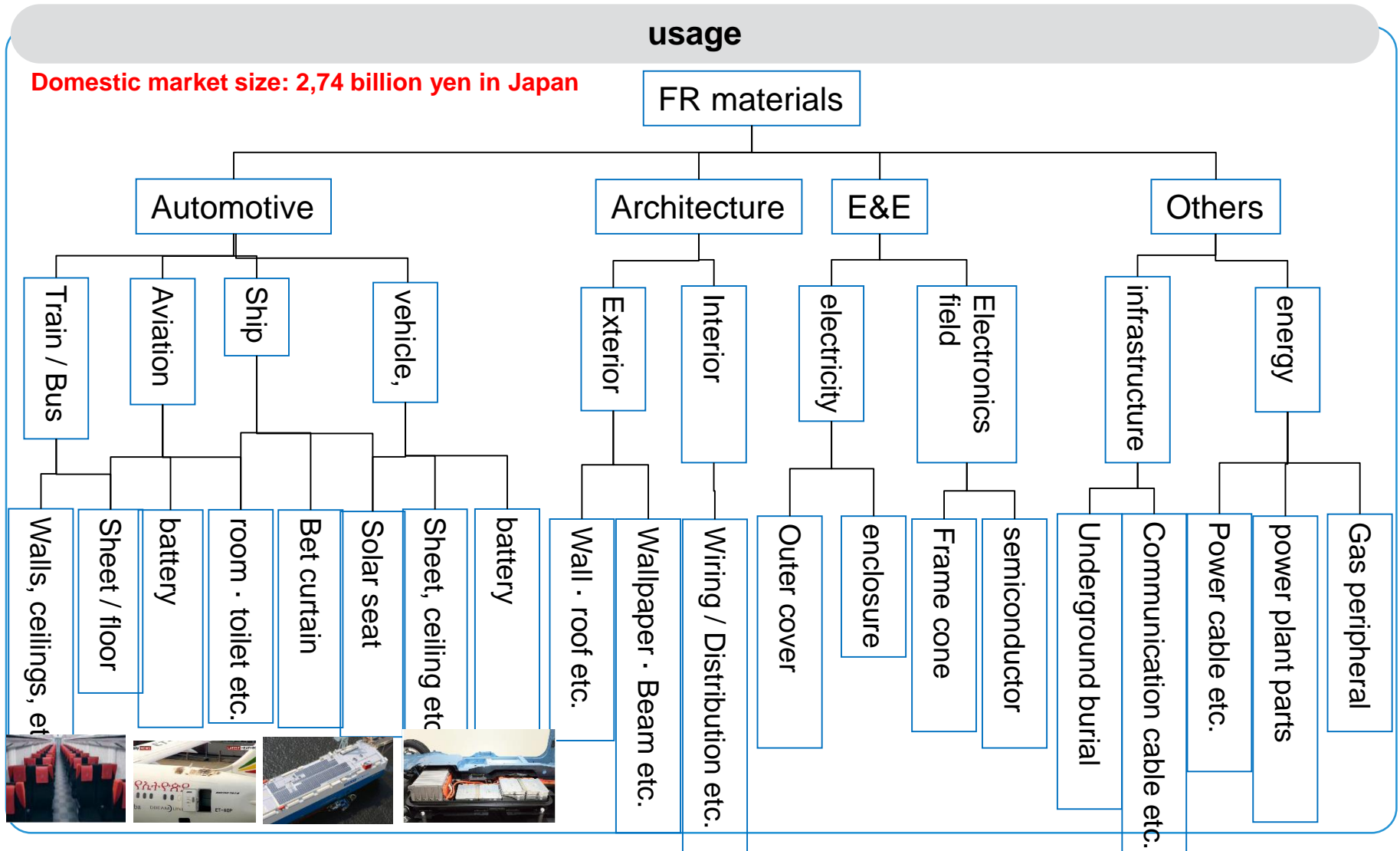
Flame retardant is one method of protecting people's lives and properties from fire.

Fire deaths by age in Japan



# Usage of flame retardant materials

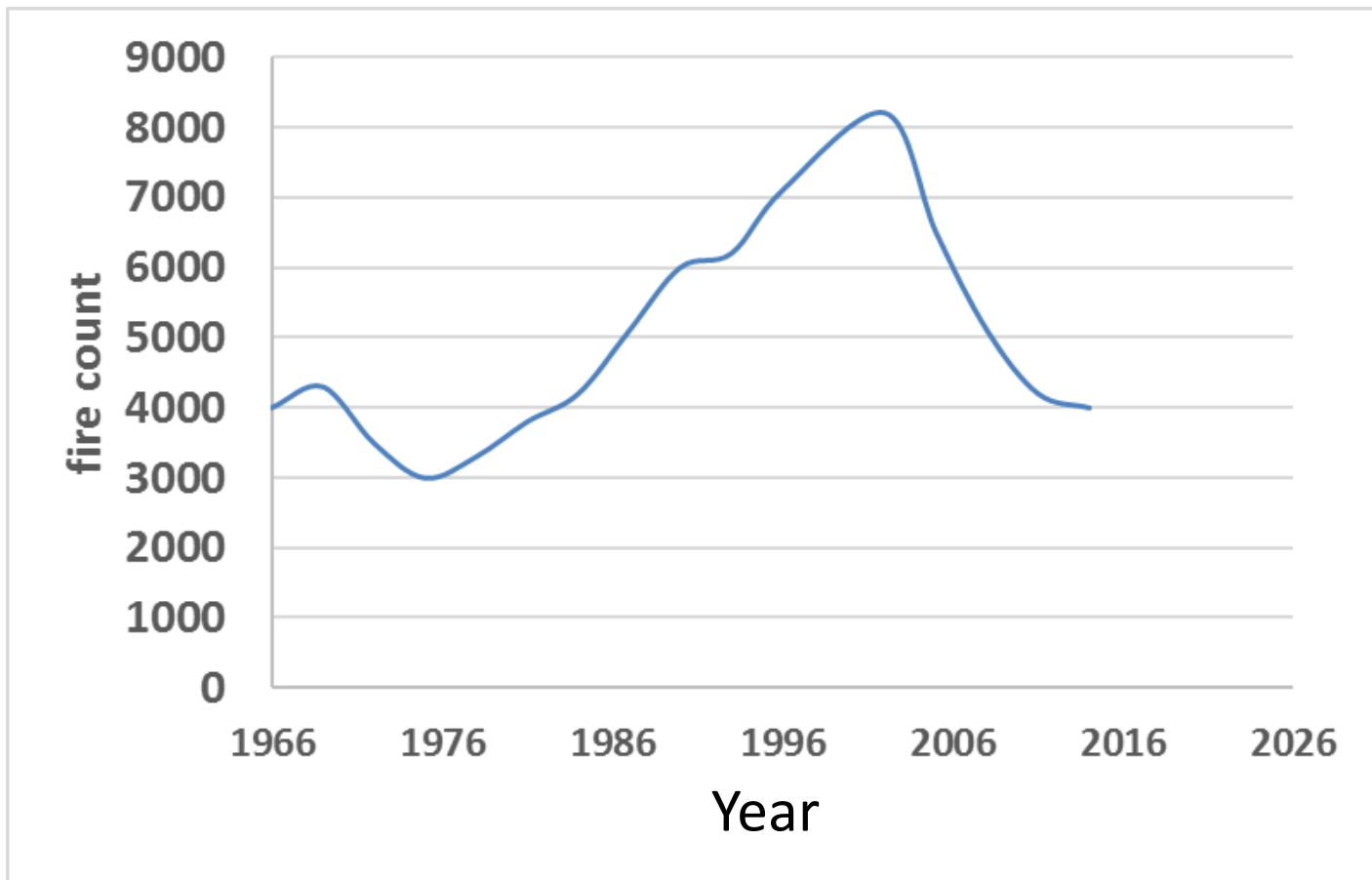
- ✓ It has a wide range and socially essential base materials



# Vehicle Fire Accident in Japan

- ✓ Fire accidents tend to decrease in Japan

Number of vehicles fire trends



# Flame Retardant Standard

- ✓ Standards are subdivided, and there are many standards for each product.

## List of FR standard

use	
<b>E/E</b>	<b>Casing, semiconductor, connector, electric wire etc.</b>
<b>Architecture</b>	<b>skyscraper, hospital (deck, curtain, wallpaper)</b>
<b>Automotive</b>	<b>Railway , buses / special vehicles, ships, airplanes</b>
<b>infrastructure</b>	<b>Communication cable, underground buried cable, joint groove parts</b>
<b>energy</b>	<b>Power cable, power station parts, gas peripheral etc.</b>

# Standards of Automotive Flameretardant material

- ✓ flame retardant standards for each application..

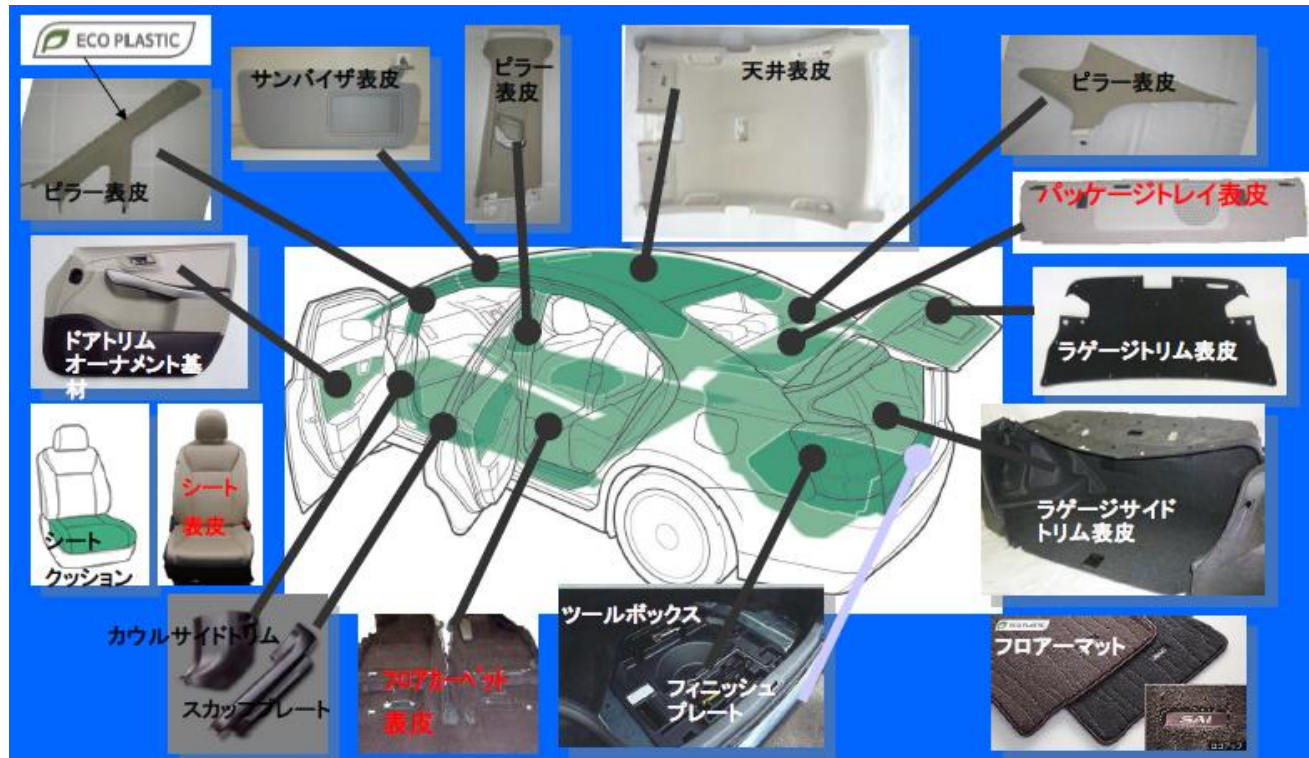
## Flameretardancy Standards of Automotive

<b>Automobile</b>	<b>Interior material</b>	<b>FMVSS302</b>
	<b>others</b>	<b>Battery periphery, connector, wiring cable etc.</b>
<b>Passenger vehicle</b>	<b>train</b>	<b>BS EN 45545-1</b>
	<b>Bus - special vehicle</b>	<b>Same as above standard</b>
<b>Ship</b>	<b>Marine outfitting materials</b>	<b>SOLAS II -2</b>
<b>Airplane</b>	<b>Interior material</b>	<b>FAA part25,BSS7230-7322</b>

# Flame Retardant Part of Car (interior)

Seat, seat belt, ceiling cloth, convertible top, arm rest, door trim, front trim, rear trim, side trim, rear package tray, head back tilt control device, carpet, mat, sun visor, sunshade, wheel house cover etc.

## Flameretadant parts of car interior

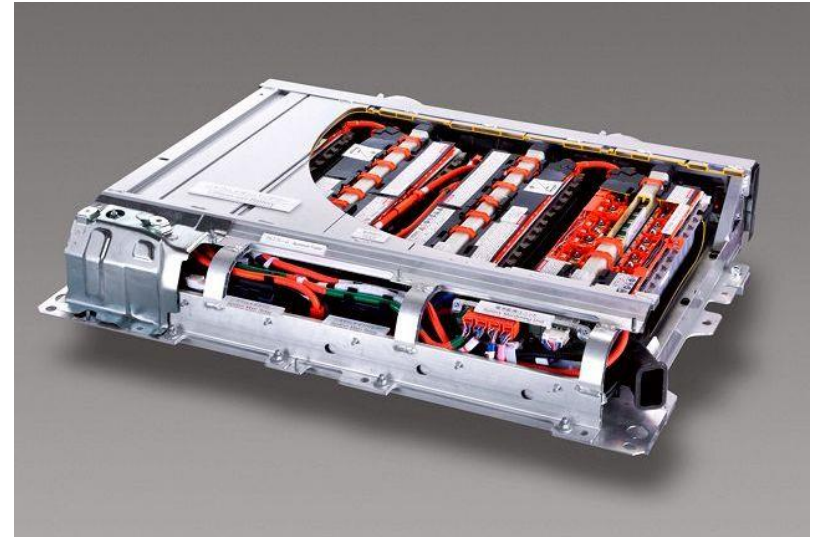
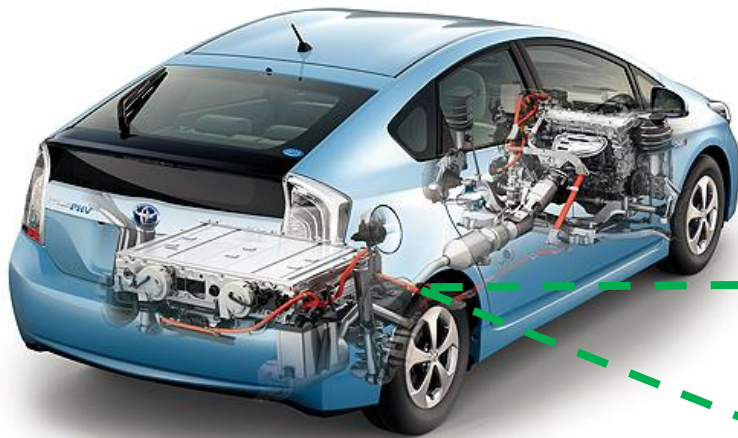




# Battery Vehicles

- ✓ Particularly, as automobiles become more EV in the future, battery performance improvement is expected.

Battery equipped car (image)

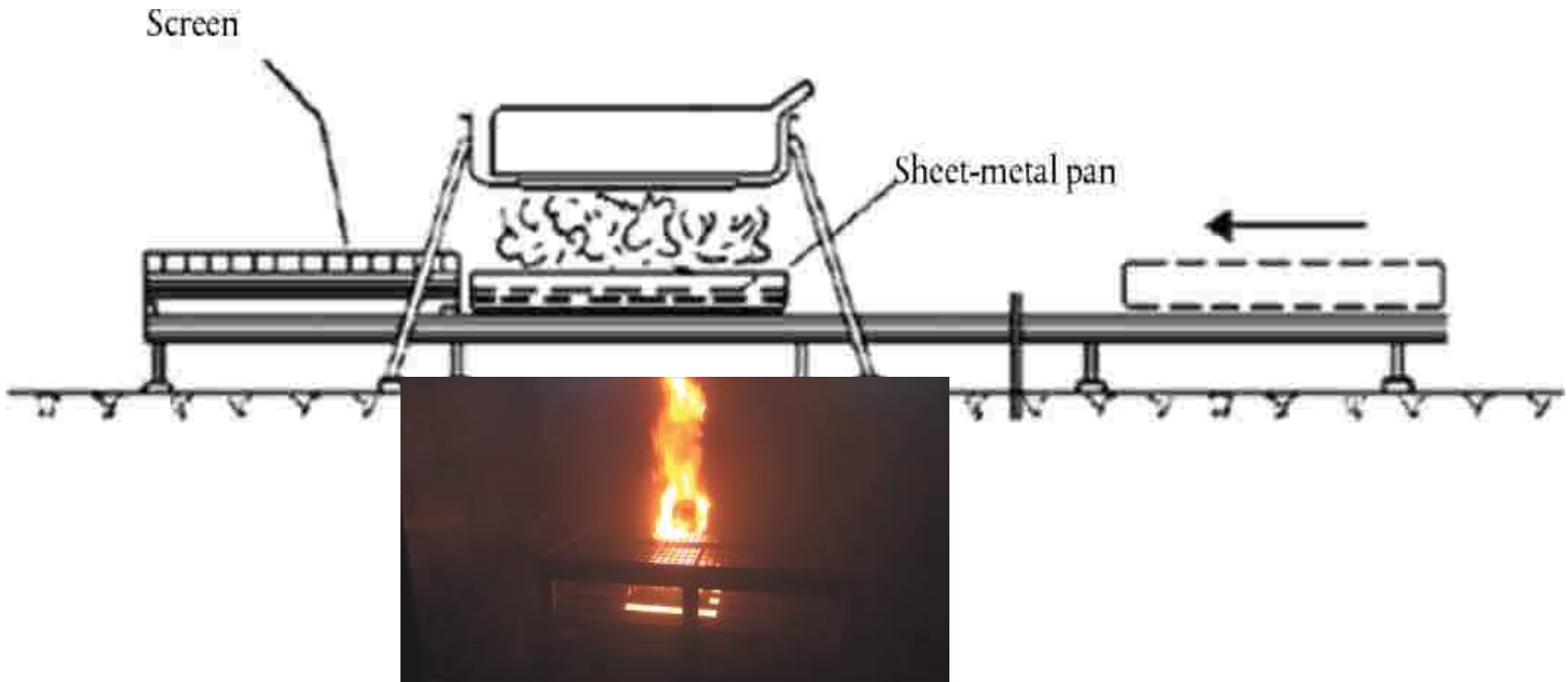


# External Flame Test

✓ UN ECE R100-02. Part

United Nations agreement regulation on battery-powered electric vehicles.  
Electric vehicles etc.

Battery combustion test schematic diagram



# Flame Test of Battery Materials

- ✓ In the future, severe endurance tests are planned for batteries.

## Standard No.

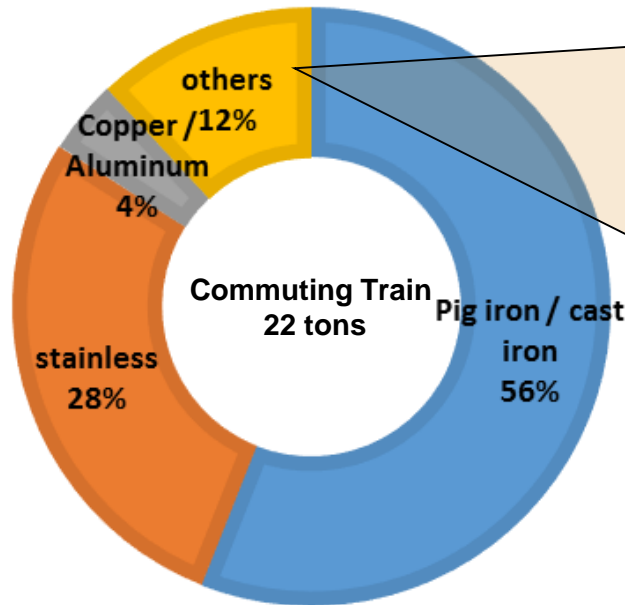
	Current standard		In future ?
Standard No.	UN R100-03	GB/T 31467.3	GTR(Global Technical Regulations) 5.4.12
Flame retardancy to external flame	Y	Y	Y
Flame retardancy for internal hot gas	N	N	Y

# Train Material



- ✓ The rate of use of polymer materials in trains is lower than that of automobiles
- ✓ For safety reasons, all resin parts have a flame retardant properties.

## Train Constituent Material



material	usage
PVC	Floor coverings, roof cloths, hanging leather bands
FRP	Outer plate, front cover
polyester	Cushion etc.
melamine	Ceiling board, door
ABS	Armrest, Air control plate
PC	Window , handle, shelf
paint	Body

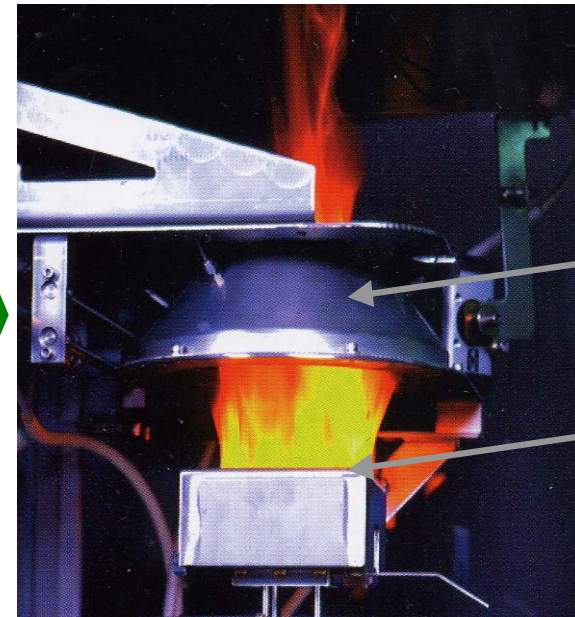
# Revised Standard of Railway Ceiling Material

- ✓ As for the train wall material, ceiling material, The standard changed from current standard to new standard.

**Traditional combustion test in JPN**



**ISO5660**

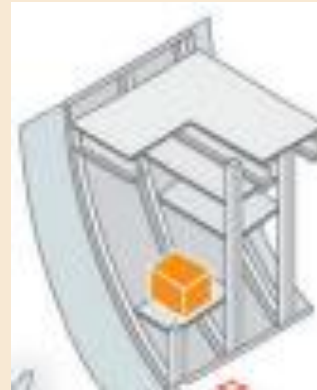
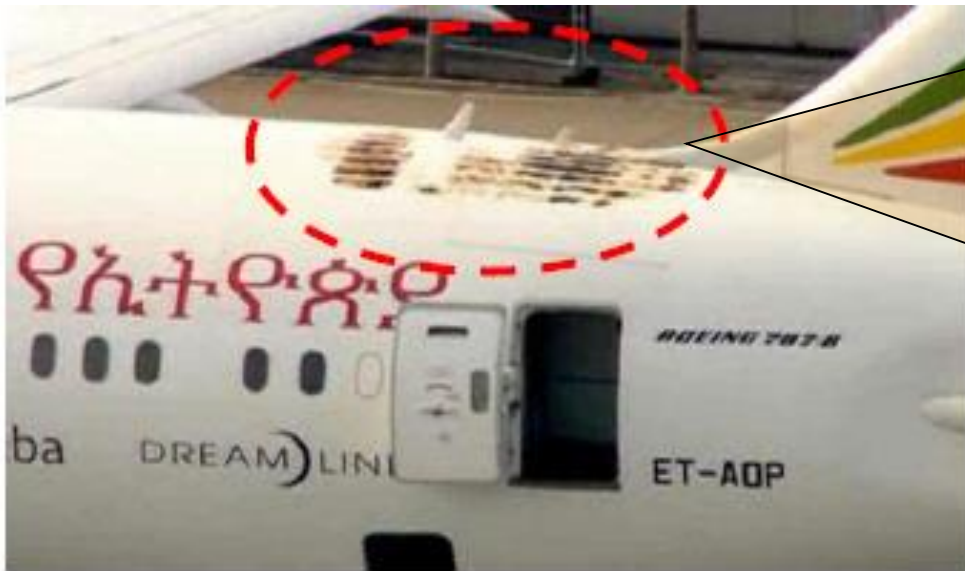


Cone Heater

Sample

# A fire on Boeing 787 at Heathrow Airport in 2013

## Accident situation





# Solar Panel issues

The spread of solar panels, which are composite materials, is rapidly developing, and weight reduction study (polymer material) is ongoing.

**ship**



<http://www.tokyo-np.co.jp/article/economics/news/CK2012062502000207.html>

**vehicle**



<http://monoist.atmarkit.co.jp/mn/articles/1401/06/news060.html>

# Combustion Test of Solar Panel

## Combustion test

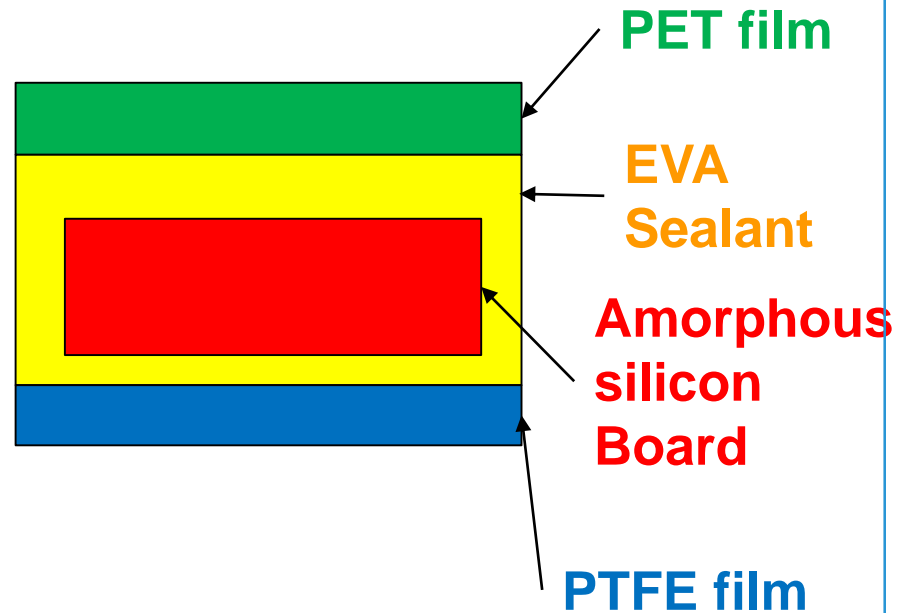


UL-790



Building Standard , Brand Combustion Test

## Constituent material





# Status of Flame Retardant Regulation (BFRs)

✓ Conformity to environmental regulations is indispensable for flame retardants

FR	Regulatory trend
Bromine compound (BFRs)	<ul style="list-style-type: none"> <li>• TBBPA/ATO; Two flame retardants are listed in the evaluation target substance by RoHs (2018)</li> <li>• Specified chemical substance's designation of Antimony Trioxide in Japan (Sep. 2017)</li> <li>• Deca Bromophenol Ether proposed to the POPs treaty</li> <li>• On the possibility that c-OctaBDE is designated as POPs substance and its effect on decabromodiphenyl ether</li> <li>• Comment on POPs treaty risk profile for short chain chloric paraffin</li> <li>• Deca-BDE ; Completely exempt from RoHS directive subject matter The European Commission (EC)</li> <li>• PBB / PBDE restricted by RoHs</li> </ul>

# Specified Chemical Substance's Designation of Antimony Trioxide in Japan

- ✓ Industries that handle ATO are subject to the regulation of specified chemical substances.
- ✓ Acceptable concentration: 0.1 mg / m<sup>3</sup> in Japan (in Europe and the United States 0.5 mg / m<sup>3</sup>)
  - \*Exception of regulations  
ex.) Handling of ATO solidified with resin (pellet)

# Status of Flame Retardant Regulation (PFRs)

✓ Conformity to environmental regulations is indispensable for flame retardants

FR	Regulatory trend
Phosphorous compound (PFRs)	<ul style="list-style-type: none"><li>• The view on bisphenol A bis diphenyl phosphate R-53 designation (Feb. 2010)</li><li>• Position paper on eutrophication of phosphorus flame retardants (July 2006)</li><li>• Report on human health risk assessment of phosphate ester flame retardant / plasticizer(March 2006)</li><li>• Report on phosphine generation test from red phosphorus (January. 2006)</li></ul>

# Summary

## The issue of flame retardancy

Flame retardant technology is aimed at securing time to escape from the fire by developing advanced flame retardant materials and protecting public life and property from fire. The flame retardant has the following issues.

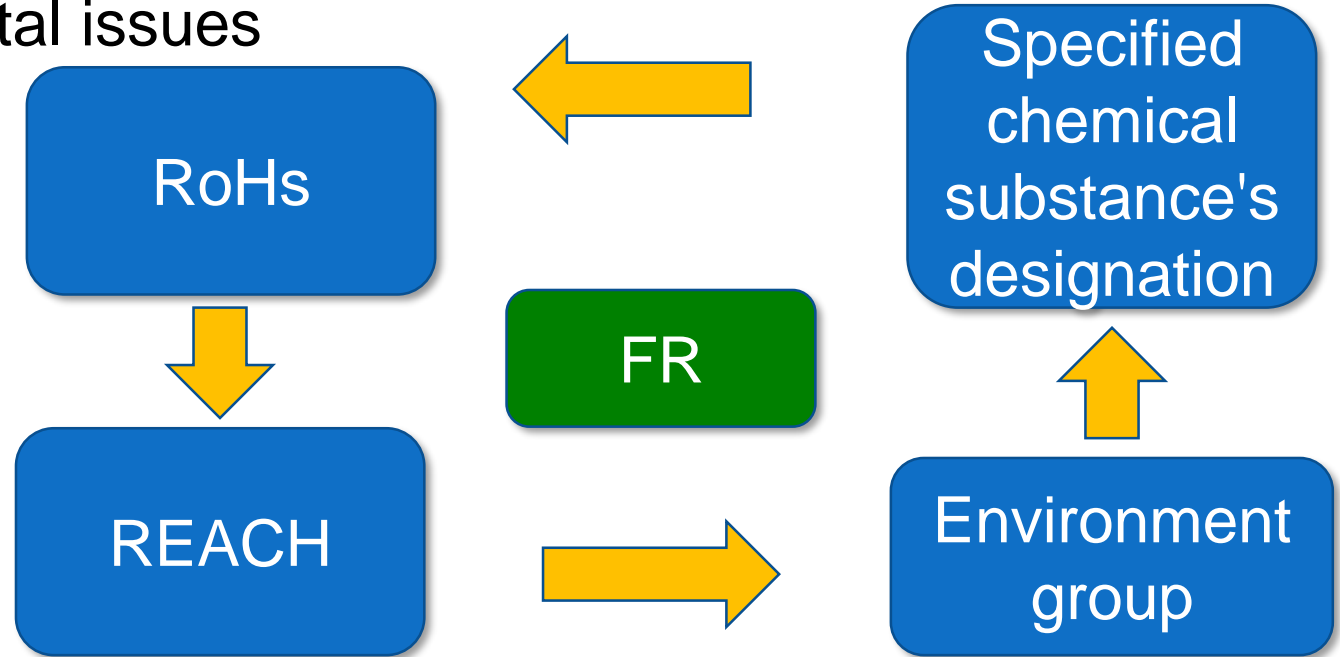
- FR Standards (Many different standards)

use	
E/E	Casing, semiconductor, connector, electric wire etc.
Architecture	skyscraper, hospital (deck, curtain, wallpaper)
Automotive	Railway , buses / special vehicles, ships, airplanes
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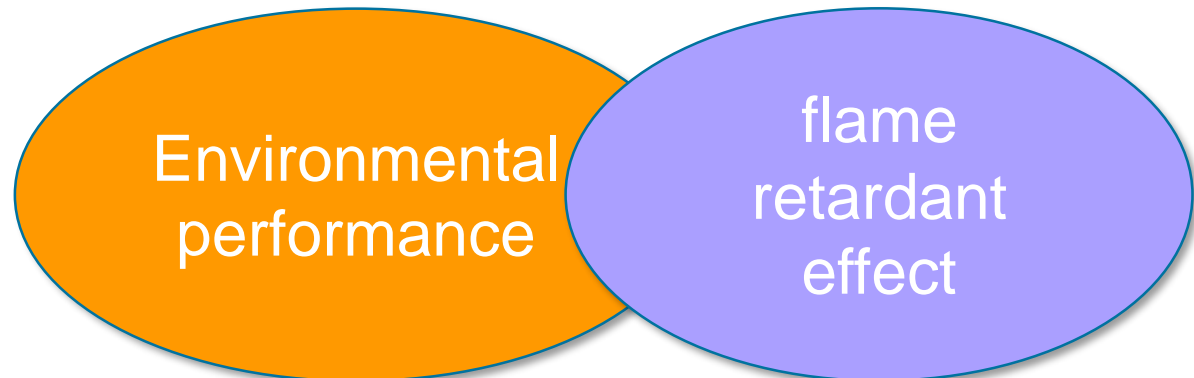
# Summary

## The issue of flame retardancy

- Environmental issues



- Technical issues



# reference

Information on flame retardant materials in Japan

- ✓ Regulation; FRCJ <http://www.frcj.jp/>
- ✓ Technology; FRTECH <http://www.fr-tech.jp/>
- ✓ Flameproof materials; JFRA <http://www.jfra.or.jp/>
- ✓ Br information; BSEF <http://www.bsef-japan.com/index/>
- ✓ Research : retrieval " Dr. Masayuki Okoshi" on research gate ,  
research map, or J-global