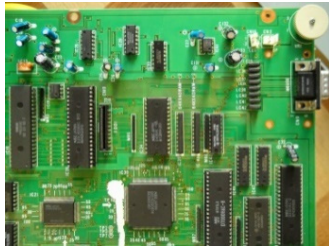


# Analysis of ionic impurities in an epoxy resin for electronic materials

Ionic impurities in epoxy resins used for printed circuit boards and underfill materials cause degradation of electrical properties and corrosion of wiring. Hydrolyzable ionic impurities can be determined using water extraction preparation, and the evolved gas analysis provides insight into degradation.

## Analysis of ionic impurities in an epoxy resin



Printed circuit board

Ionic impurities in epoxy resins

- Raw materials : Cl, Na, K
- Flame retardants : Br, P
- Electrical degradation
- Corrosion of electrode wiring
- Short circuit / insulation failure

It is important to determine ionic impurities which cause defects.

Ionic impurities in epoxy resins cause defects due to hydrolysis and thermal degradation.

➔ Ion chromatography is powerful for analyses of these ions.

**Pretreatment:**  
Water extraction, Evolved gas trapping

**Measurement :**  
Ion chromatography (IC)

## Analysis of a glass epoxy resin (FR-4)

### Pure water extraction analysis

Analysis of ionic impurities eluted by hydrolysis

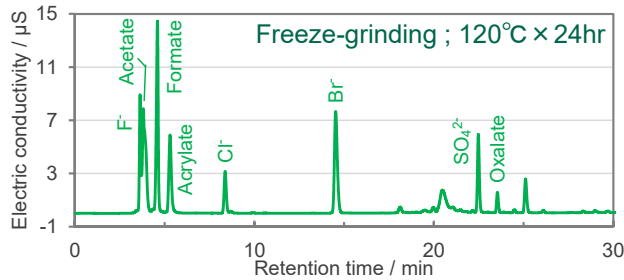
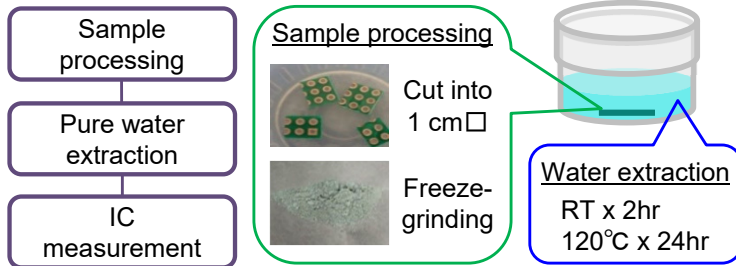


Figure 1 Chromatogram of extracts from the glass epoxy resin

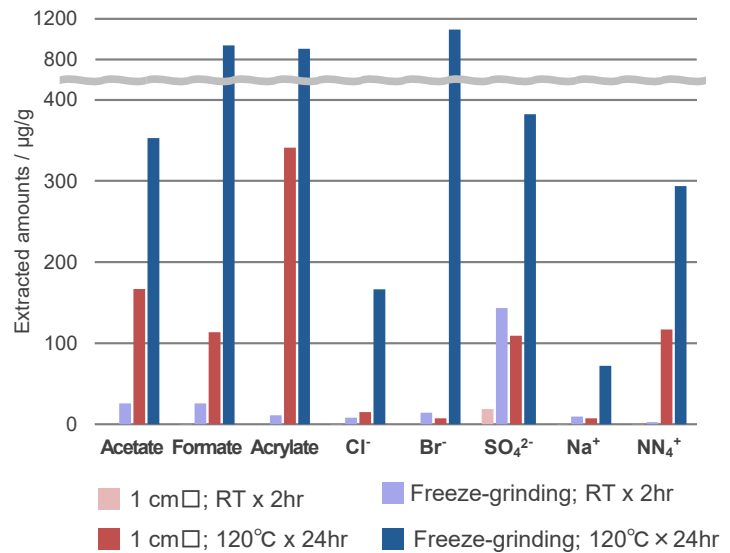


Figure 2 The difference of extracts among extraction methods

Halogens and cations extracted under conditions (light red, light purple) were around 10 µg/g.  
➔ Suppose that ionic impurities that may cause defects is evaluated.  
Extracts obtained by condition (dark blue) were thought to be parts of resins and flame retardants.  
Acetate, formate and acrylate were presumably derived from the solder resist.

In order to obtain appropriate information, it is important to select an extraction method in accordance with the purpose.

### Evolved gas analysis

Analysis of ionic species outgassed under specific conditions

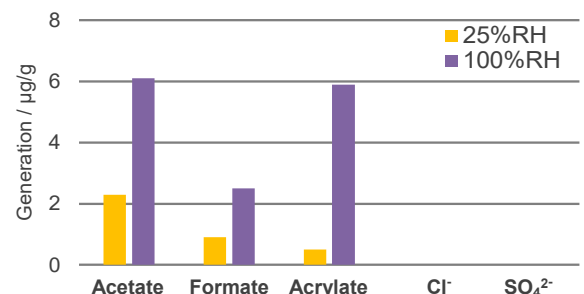
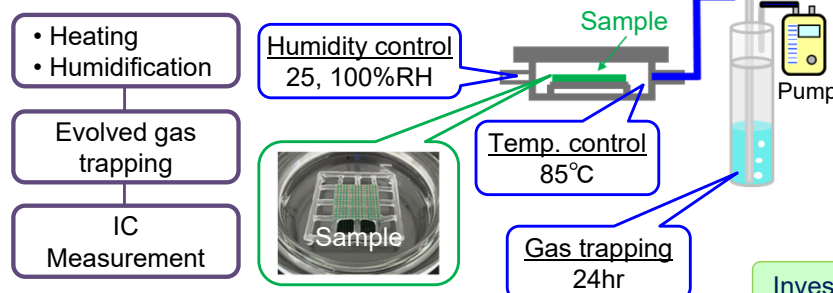


Figure 3 Ionic species outgassed from the glass epoxy resin under 85°C and humidified conditions

Investigation of gases generated via usage and degradation.

Ionic impurities in epoxy resins can be extracted and quantitated with appropriate methods.