

Asbestos

Refractory Ceramic Fibres



The image features two vertical panels. The left panel shows a dense network of thin, wavy, and curved fibers, characteristic of asbestos. The right panel shows a network of thicker, more rigid and straight fibers, characteristic of refractory ceramic fibers. Both panels are set against a dark blue background.

**Recupel 2023 Study:
Asbestos and Refractory Ceramic fibres (RCFs)
in Waste Electrical and Electronic Equipment**

Study: Are there RCFs & Asbestos in WEEE?

Collection

- Recupel coordinates the collection and treatment of discarded electrical and electronic equipment (WEEE).
- These devices are collected in six streams and delivered to treatment operators



- The analysed “Other” stream includes ICT, small household appliances, garden tools, audiovisual equipment,...

Depollution

- Treatment operators sort out devices susceptible of containing hazardous substances
- Devices (or components) containing hazardous substances are then sent to specialised companies for disposal (incineration/landfilling).
- Two known hazardous substances are asbestos and refractory ceramic fibres (RCFs)

Study Method 2023

Carried out at 2 of Recupel's treatment operators by Asper-ABO

1. **Recupel appliance list** : 78 of 538 types of appliances (14%) were identified as being susceptible of containing RCFs and/or Asbestos
2. **Suspected appliances were set aside**: where RCFs may have been used due to their fire-resistant or insulating properties included; ovens, sandwich makers, waffle irons, kettles...
3. **Inspection of appliances by Asper-ABO**: Each was checked for asbestos or RCF-suspected components. Devices were disassembled as much as possible. If suspicious materials were found (asbestos or RCFs), samples were taken for analysis.

Asper-ABO also carried out similar studies for Recupel in 2011 & 2018. RCF fibres were analysed by Fibrecount

- fibrecount.be/contact-us/
- www.abo-group.eu | www.abo.be | abo@abo-group.eu



Asbestos fibres

Properties

- A collective name for naturally occurring minerals
- When broken, they become crystals so small that they are not visible to the naked eye.
- From 1945 until the 1980s, asbestos was widely used in buildings, homes, and installations for its **durability, insulating, fire-resistant, and low-cost** properties

Uses

- Asbestos has long been used for its fire-resistant properties. It is manufactured into long bundles composed of crystals.
- Asbestos was also used in electrical and electronic appliances for similar reasons in the past but currently the use of asbestos is prohibited!

Health Effects

- Inhaling small asbestos fibres can cause a number of diseases in humans (asbestosis, lung cancer, mesothelioma, etc.) and exposure should be avoided where possible.
- EU: Asbestos is classified as a category 1 carcinogen, i.e. there is proof exposure to this substance can cause cancer in humans.

Refractory Ceramic fibres (RCFs)

Properties

- Ceramic fibres are white fibrous solid that are a specific type of man-made vitreous fibre (MMVF), or as less commonly used, synthetic vitreous fibres (SVFs).

Uses

- Generally as insulation material for high temperatures and most often in heavy industry. In the Automotive industry for heat shielding. They are also used in other applications for their soundproofing properties.
- These fibres have many purposes and are used in various technical applications as high-temperature sealing materials due to their **stability at high temperatures**.
- They are also present in WEEE that is to be recycled. Currently use of RCFs is permitted as long as there are no economically feasible replacements that meet the technical requirements of the application.

Health Effects

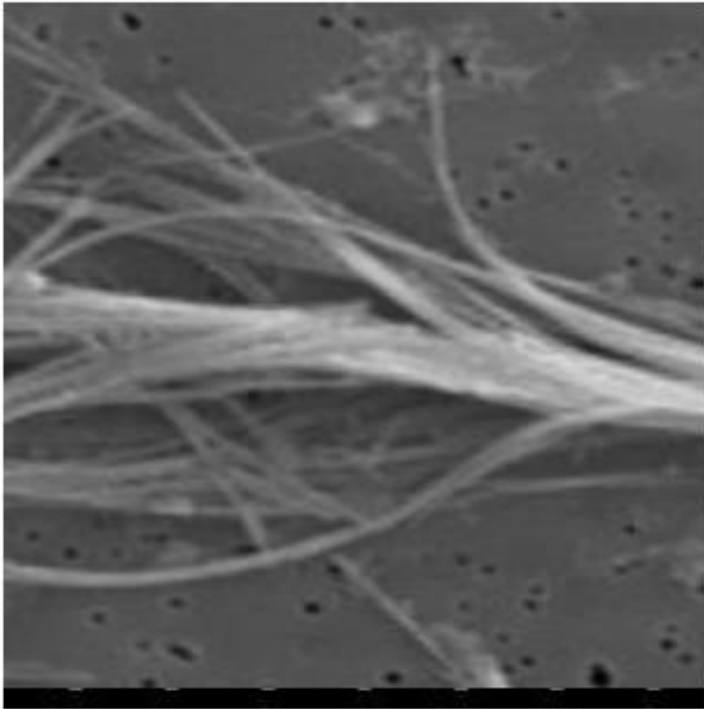
- Irritation of skin, eyes, respiratory system and decrease in lung function
- EU: RCFs are classified as a category 2 carcinogen, i.e. there is a strong suspicion that exposure to this substance can cause cancer in humans.

Analysed Appliances – Asbestos = A; RCFs = R

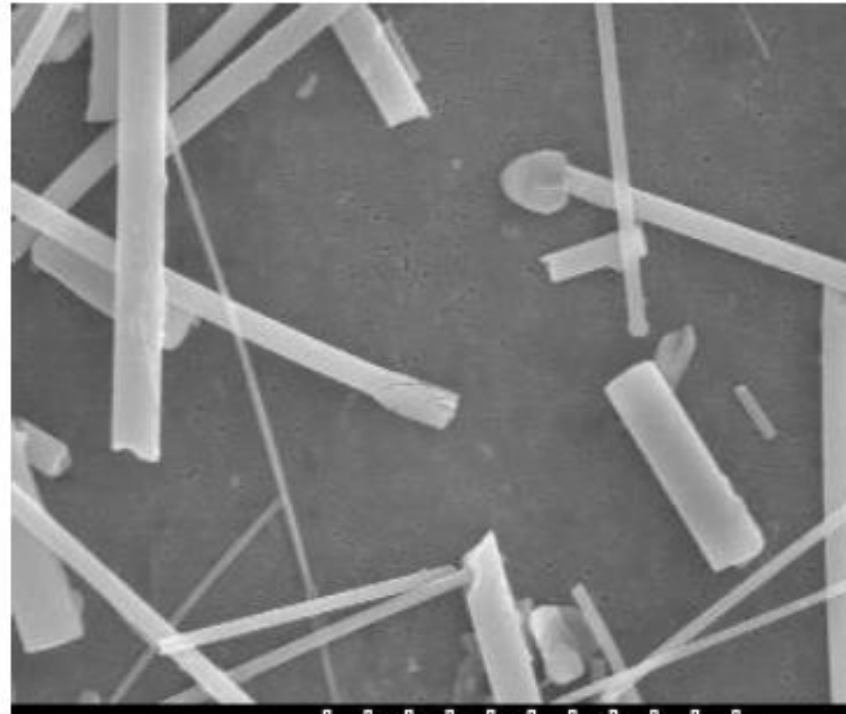
WEEE type	HW	WEEE type	HW	WEEE type	HW
Iron	A	Fryer		Steam iron	
Oven (lab. muffle)	A	Raclette grill		Heater	
Dish / food warmer	A	Hairdryer		Foot warmer	
Toaster	A	Grill (freestanding)		Foot massager	
Sandwich maker/waffle iron	A	Hair curler / straightener		Kettle	
Electric hotplate	A	Coffee maker		(CRT) Monitor	
Radiant (ceramic) cooktop	R	High-pressure cleaner		Bread maker	
Handheld mixer		Tap beer dispenser		Electric blanket	
Pizza pan		Paint stripper		Tanning bed	
Microwave		Portable heater/radiant panel		Fondue set	
Wok		Steriliser		Heating pad	

Breaking mechanism of fibres

Asbestos



Refractory Ceramic Fibres



Precautionary statement pictogram:
Carcinogenicity

Each division 1 micron

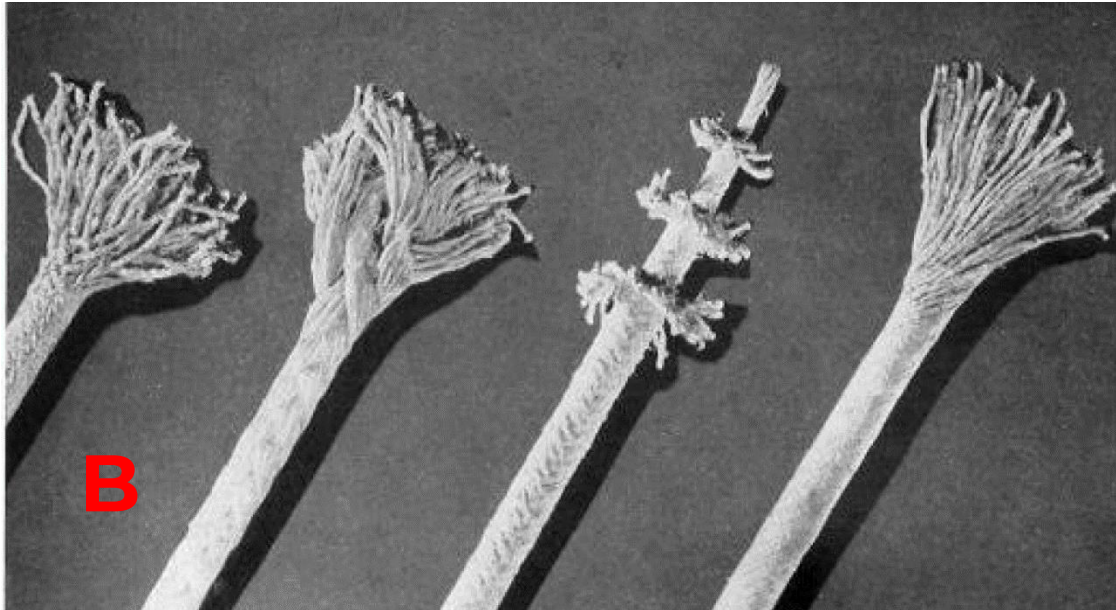
Each division 2 microns

Code of good practice/Code van goede praktijk: Werken met vuurvaste keramische vezels [Internet]. AGORIA; 2010 [cited 2024 Apr 13]. Available from: <https://www.agoria.be/nl/diensten/expertise/hr-legal-social-dialogue/welzijn-en-veiligheid/welzijnsbeleid-en-algemene-beginselen/codes-van-goede-praktijk>

Asbestos forms

Asbestos was used as an electrical or heat-insulating material:

- A. Asbestos board: Very loose fibres can easily become airborne
- B. Asbestos cord: Similar to asbestos board
- C. Asbestos cement: Fibers are tightly bound but can be released when broken or weathered



RCF forms

RCFs can be either crystalline or amorphous, i.e., they do not have a definite form, resulting in them having numerous compositions, forms and sizes

They are mainly manufactured in the form of wool or blankets, but also exist, as is found in cooktops, in the form of vacuum-formed shapes around heating elements



MATERIALS MADE FROM HIGH-TEMPERATURE INSULATION WOOL



WOOL / BULK FIBER



MATS / BLANKET



MODULES



PAPER



TEXTILES / ROPES



ADHESIVES / MOLDABLE MIXES



VACUUM FORMED PRODUCTS: BOARDS / SHAPES

Irons: Asbestos



Muffle oven (laboratory instrument): Asbestos

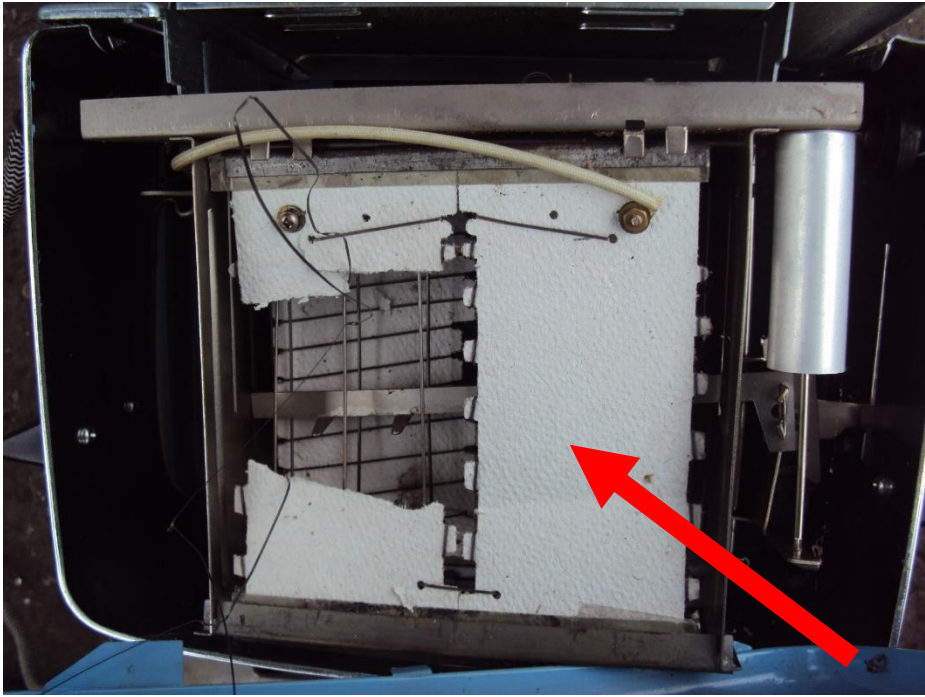
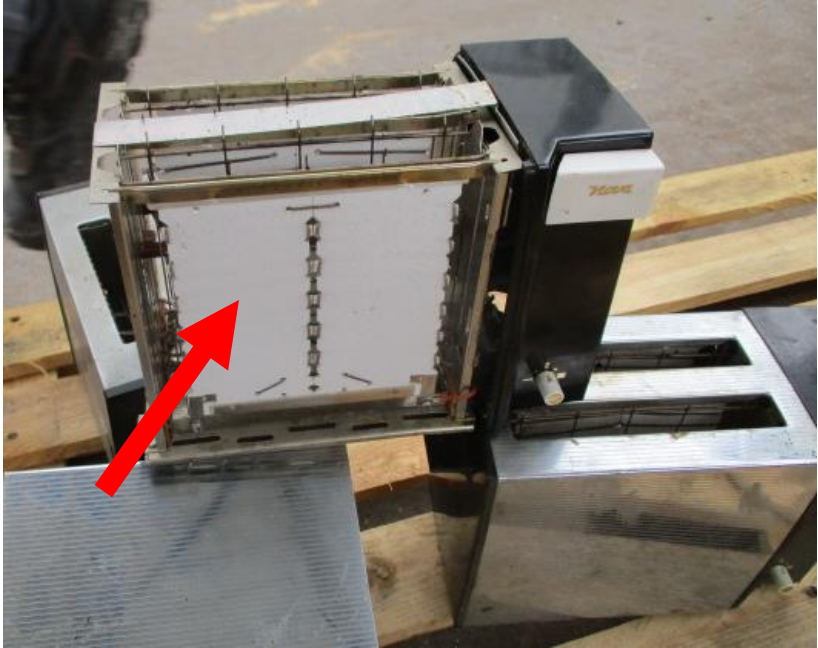
Specialised oven that heats materials to **extremely high temperatures** whilst isolating them from fuel and the byproducts of combustion from the heat source



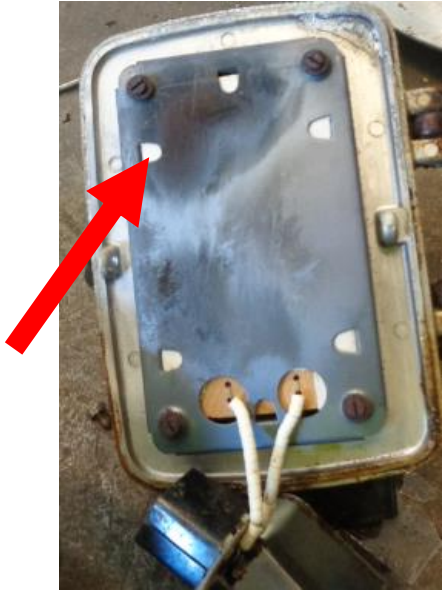
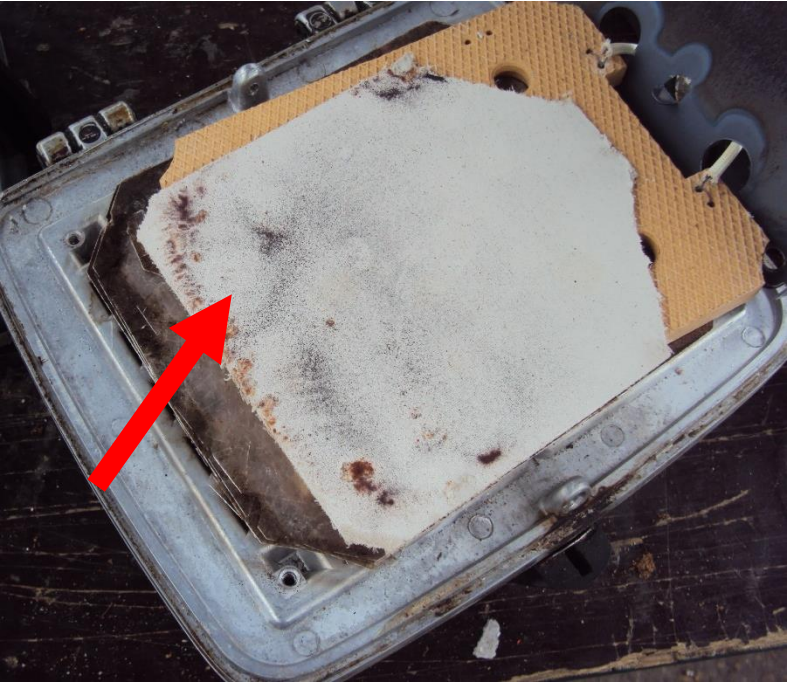
Dish / food warmer: Asbestos



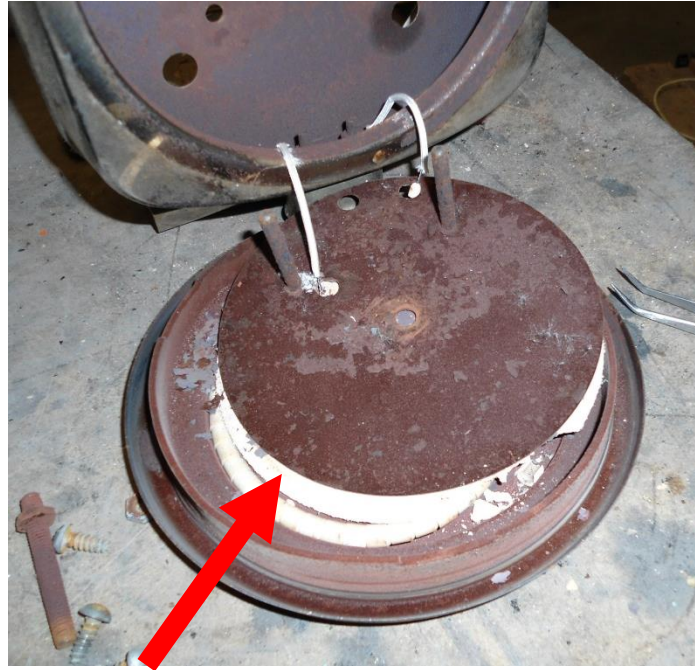
Toaster: Asbestos



Sandwich maker/waffle iron: Asbestos



Electric hotplate: Asbestos



Radiant (ceramic) cooktop: Refractory ceramic fibres



Conclusions

Asbestos: Based on the study, a limited number of Recupel appliances were found to contain asbestos in various forms.

Safety Measures :

- ✓ Handle suspected asbestos materials in a separate, enclosed, ventilated area & place them in airtight packaging.
- ✓ Do not open, break or remove suspected asbestos components.
- ✓ Wear full PPE, including a gloves, gowns, shoe covers, head covers, FFP3 masks, respirators, eye protection, face shields, and goggles.

RCFs: RCFs were only found in radiant (ceramic) cooktops with a glass top plate in the in the form of vacuum-formed shapes around heating elements that are only visible after disassembly.

- RCF suspected containing cooktops should be dismantled whilst taking safety measures as for asbestos (see above).
- Cooktops with a glass plate but **NO** fan on the underside should be assumed to contain RCFs.
- Whether RCF materials are hazardous or not can be established on the basis of colour. Dangerous fibres (Type 1) are white and non-dangerous fibres (Type 2) are brown/blue/grey/beige.
- No RCFs have been found in induction cooktops, which can be identified by the (large) fan(s) on their underside.

Induction cooktops

Presence of a fan on the underside. These may be treated as non-hazardous WEEE, i.e. in a shredder.



Radiant (ceramic) cooktops

No fan -> deemed to contain RCFs

Dismantled heating elements (including housing & thermostat) to be handled and stored the **same as asbestos** unless it can be identified as non-hazardous on the basis of the colour -> see next slide



Non vs Hazardous radiant (ceramic) cooktops

Hazardous? Depends on the colour.

- ≈30% Dangerous fibres (Type 1) are **white** -> disposal
- ≈50% Non-dangerous fibres (Type 2) are **brown/blue/grey/beige** -> regular treatment (same as ≈20% induction cooktops)
- Beware! some devices that are a mix of 1&2 -> treat as hazardous

Distinguishing between type 1 and 2



Dismantling Procedures Recapel

Recupel's next contracted 3-year treatment period calls for treatment operators to put in place procedures for the safe dismantling of RCF containing cooktops and appliances containing asbestos in an appropriate and segregated workspace. Recapel aims to only dispose of hazardous materials and components and no longer entire appliances.

Asbestos

The use of a "simple treatment" process is to be put in place to remove fixed, non-damaged asbestos components. When carrying out this process, the prescribed safety measures of the competent authority must be respected, as well as applicable legislation, including but not limited to the following:

- Title 3 & Title 4 of Book VI of the Belgian Codex on well-being at work
- EU Directive 2023/2668 which comes into force from 21 December 2025 on the protection of workers from the risks of exposure to asbestos at work.

RCFs

Recupel is working with a treatment operator to outline a safe cooktop dismantling process where fibre concentration during dismantling will be measured. It is foreseen to share this process with all treatment operators and other PROs.

- At a minimum, the following safety precautions will be taken when carrying out this process:
 - In a segregated area with the necessary ventilation, a regularly maintained (HEPA) air filtration system and perform daily cleaning of the workspace.
 - It will comply with the '[Code of good practice: Working with refractory ceramic fibres](#)' published by Agoria (the organisation representing employers in the Belgian technology industry).

Questions for Recupel?

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