

## Focus on IFA's work

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# Permeation of PCBs in transformer oil through chemical protective gloves

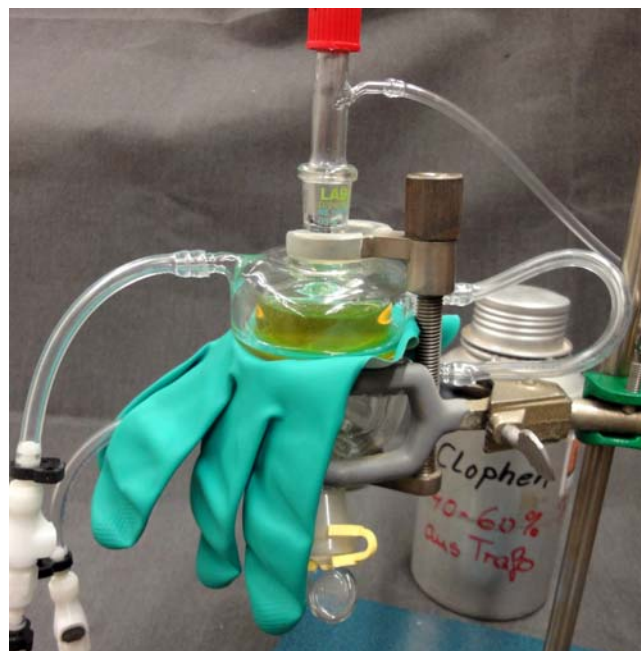
## Problem

Owing to the high hazard potential of transformer oils containing polychlorinated biphenyls (PCBs), comprehensive safety measures must be taken to protect workers during the recycling of end-of-life transformers. These measures include suitable chemical protective clothing and chemical protective gloves. For the testing of chemical protective gloves against the standard, only permeation by selected test substances is tested, and not by substance mixtures containing PCBs. Consequently, the results do not constitute a suitable basis for recommendations for the selection of gloves for use with transformer oils containing PCBs.

## Activities

Selected standard chemical protective gloves manufactured from a range of materials of different thickness were wetted in a permeation cell with a transformer oil containing PCBs. For detection of the permeating substances in the transformer oil, the method developed during an IFA project was employed, involving solid-phase microextraction (SPME), gas chromatography and mass spectroscopy. This enabled the permeation to be determined semi-quantitatively over a period of between eight and 240 minutes.

The IFA selected the test samples with reference to the manufacturer's data, availability on the market, and its own empirical findings.



Permeation cell and glove sample

## Results and Application

Since the tests did not comply with the standard, the results are suitable only for comparison of the gloves with each other.

Besides homologous series of PCBs (dichlorobiphenyl, trichlorobiphenyl, tetrachlorobiphenyl), chlorobenzenes (dichlorobenzene, trichlorobenzene, tetrachlorobenzene, pentachlorobenzene) were also detected.

The following conclusions can be drawn from the results:

- Where a mixture containing PCBs also contains substances capable of permeating a particular material, they may also enable the PCBs to permeate it. The study showed this to be the case for chlorobenzenes.
- Should such substances be absent or be present only in small quantities, PCBs will in all probability not be able to permeate through the glove material.
- The material with the greatest resistance was nitrile rubber with a thickness of at least 0.45 mm. Thin disposable nitrile gloves are not suitable for this application.
- Materials of greater thickness (> 0.7 mm) may prevent the permeation of PCBs, even if permeated by chlorobenzenes. This is however not a general rule and depends upon the material concerned.

The results relate to the materials employed in the study and to the substance mixture that was made available. Mixtures with a different composition or involving other components may give rise to substantially different permeation behaviour.

### Area of Application

Social accident insurance institutions, for the support of all areas of industry dealing with transformer oils.

### Additional Information

- EN 374-3: Protective gloves against chemicals and micro-organisms – Part 3: Determination of resistance to permeation by chemicals (12.03). Beuth, Berlin 2003
- BGI/GUV-I 868: Information Chemikalienschutzhandschuhe. Published by: Deutsche Gesetzliche Unfallversicherung (DGUV), Berlin 2009
- Practical solutions: Chemical protective gloves, [www.dguv.de/ifa](http://www.dguv.de/ifa), Webcode e109388

### Expert Assistance

IFA, Division 3: Hazardous substances: handling – protective measures

### Literature Requests

IFA, Central Division