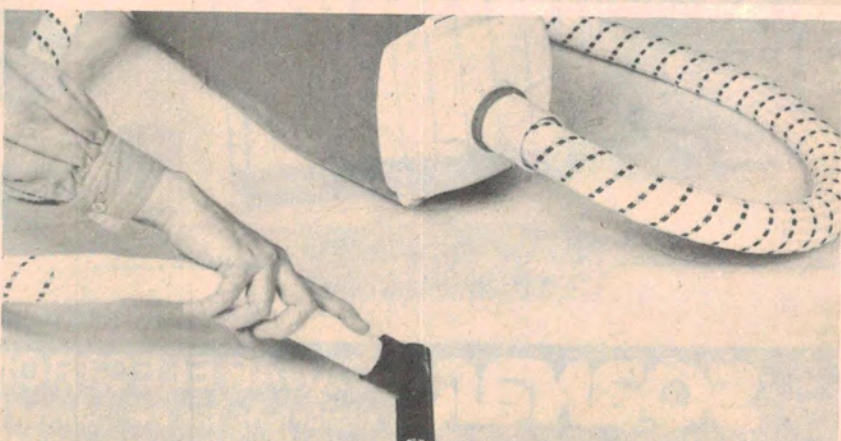
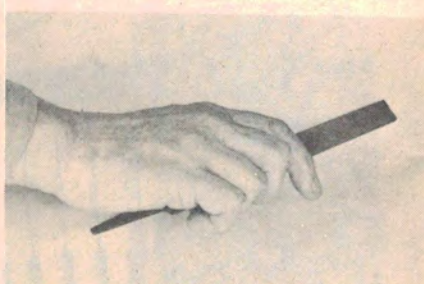
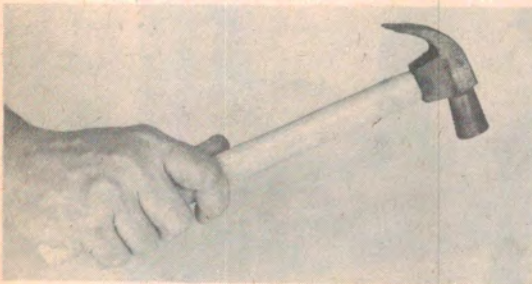
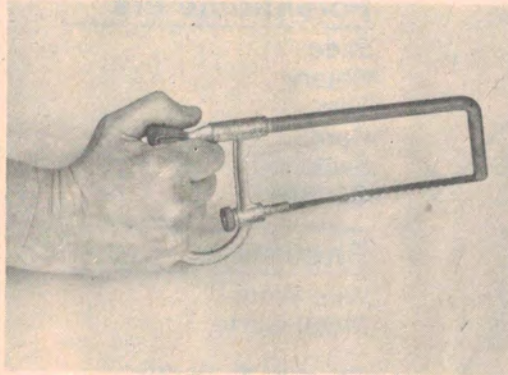


Beryllium — how dangerous?

Beryllium compounds are insidious poisons — they can lie in the body for up to five years before showing any effects — and they can kill. Have you any beryllium in your junk box?

BERYLLIUM COMPOUNDS ARE QUITE SAFE — PROVIDING THEY'RE LEFT WELL ALONE

DO NOT: grind, saw, put with acid, crush, chip, file, brush or vacuum the material!



THERE IS a lot of controversy these days about the toxic effects of everyday substances — saturated hydrocarbons in food, cancer-producing hair dyes, lead in petrol and so on.

It may surprise you to know that you are in contact with one very toxic substance which has cost the lives of many people over the years and which may have no warning notices or labels attached to it — it's harmless in its present form, but is only waiting for the unwary to tamper with it to turn it into a deadly cancer-forming agent.

The substance is beryllia, long used for its low thermal conductivity and high electrical insulation resistance in applications such as RF power transistors and some 'heat sink compounds'.

In its solid state, beryllia (or beryllium oxide, to give it its proper name) is fairly innocuous. It won't explode, give off noxious fumes or even catch fire. But grind or cut it in any way, and the dust formed may produce insidious lung disease. Cases have been reported in which workers who came into contact with the substance did not exhibit symptoms until five years later, and some in which the damage appeared within one or two months.

It doesn't take much dust to produce toxic effects, either. Some forty years ago, beryllia was used widely in fluorescent lighting tubes, and the number of cases of poisoning were much greater. Because of the incredible virulence of the poison, toxic effects have been reported in people who visited the homes of beryllium workers. Tests have been carried out with soiled clothing that showed that shaking even a lightly-soiled lab apron can give rise to dust concentration five times the recommended maximum.

Imagine, then, the effect of sawing a piece of beryllia in your workshop (or, worse still, in your kitchen). The worst of it is, you may not realise the effects until five years from now.

Having said all that, solid beryllia is safe enough if treated with respect.

- If there is an alternative, don't use beryllium compounds.
- Don't ever mutilate, grind, cut or even scratch beryllia.
- Always make sure that any beryllia you have is adequately labelled in such a way that there is no way that you, or anyone else, can mistake it for something harmless.
- When you want to throw out a device containing beryllia (which you probably feel like doing round about now), send it back to the manufacturer — it's pretty certain that they know how to dispose of it properly.

There is another route through which beryllia can be harmful — through the skin. Experiments with animals have shown that introducing beryllium compounds into open wounds may form tumours. If you're using a heat-sink compound that you think contains beryllia, try not to touch it — use plastic gloves and other safety devices.

If you think that beryllia has come into contact with you in any way which could prove harmful — see your doctor.

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- 1) Physical Design of Electronic Systems, Bell Telephone Laboratories, Vol 3, 1971.
- 2) Dangerous Properties of Industrial Materials, N. I. Sax.
- 3) NIOSH Registry of Toxic Effects of Chemical Substances, Vol 2, 1977.



Some of the fairly common types of devices constructed using Beryllium oxide are shown above. RF power transistors use the material as a heat transfer material between the chip and the copper stud. Stripline terminations — such as the central device in the upper group and the central device in the lower row — are less common but have construction similar to the RF power transistors. These devices are perfectly safe to handle providing you do not do any of the things suggested in the pictures on the opposite page.

BERYLLIUM OXIDE, BeO (*Beryl, Beryllia, Bromellite*) PHYSICAL, CHEMICAL AND MEDICAL CHARACTERISTICS

VOLUME RESISTIVITY: 6×10^{11} ohm.m at 300°C (98% BeO)¹

THERMAL CONDUCTIVITY: 210 W/m. °C (98% BeO at 25°C)¹

SOFTENING TEMPERATURE: 1600°C (98% BeO)¹

THERMAL EXPANSION: 6.1 ppm/°C (98% BeO)¹

TOXIC HAZARD RATING: High (acute local irritation, inhalation: may cause death or permanent injury after very short exposure to small quantities)²

LOWEST TOXIC AIR CONCENTRATION: 49 mg/m³ (rat, inhalation, four weeks continuous. Cancer)³

LOWEST TOXIC UNDER-SKIN DOSAGE: 7 mg/kg (pig, benign tumour)³

OSHA STANDARD AIR CONCENTRATION: 2 µg/m³ (time-weighted average)³

OSHA STANDARD PEAK AIR CONCENTRATION: 25 µg/m³ (30 min per 8 hours)³