ON THE PREVENTIVE CONCENTRATION LIMITS FOR ASBESTOS AEROSOLS
IN AMBIENT AND INDOOR AIR

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INTRODUCTION

Among carcinogenic industrial agents asbestos is a primary cause of death by occupational cancer in Germany (Woitowitz et al., 1988).

Problems concerning environmental and indoor exposure are also receiving increasing attention. Preventive concentration limits (PCL) for seven carcinogenic substances (arsenic, asbestos, cadmium, benzene, benzo(a)pyrene, chromium, and nickel) are in discussion in the F.R.G. A PCL of 5 ng/m³ has already been proposed for benzo(a)pyrene and a limit of 400 fibers (> 5 μm)/m³ seems to be reasonable for asbestos (Dobbertin, 1988). Another limit of 500 fibers (> 5 μm)/m³ is used in the evaluation of asbestos pollution in buildings (Bundesministerium 1986).

Measurements of asbestos fiber concentrations have been made in the F.R.G. over the past 10 years by Scanning (SEM) and Transmission (TEM) Electron Microscopy. The results of these measurements provide further information on the practical evaluation of such proposed concentration limits.

DOOR ASBESTOS

Asbestos, mostly crocidolite, was used in Germany as sprayed insulation and fire protection material in many buildings between 1960 and 1980. The total amount of asbestos was estimated to be about 200,000 metric tons. This carcinogenic material must be removed from buildings over the next 10 years.

By "post-removal" measurements the health safety for the residents has to be proved. Asbestos fiber (> 5 μm) concentrations \( \leq (500 + c_0)/m^3 \) are considered as acceptable (\( c_0 \) is the outdoor asbestos fiber concentration (Bundesministerium, 1986). This evaluation procedure uses static sampling and SEM technique (VDI-Guideline 3492, 1989) and considers the mentioned limit of 500 fibers/m³, which is high and needs corrections. In the case of crocidolite asbestos removal, the "safe" limit concentration should be 200 fibers (> 5 μm)/m³ only. However, not a static but an aggressive sampling method (Karaffa et al., 1987) had to be used for measuring indoor asbestos concentrations.
OUTDOOR ASBESTOS

Since about 1980 the demand for asbestos has decreased considerably in Germany (from about 150,000 to about 60,000 t/a). Industrial asbestos emission have also diminished. Nevertheless, asbestos is still used in Germany for the production of brake linings.

The existing asbestos-cement roofing and facade tiles containing more than 1 mio t asbestos and having a surface area of about 1000 km² are considerably corroded (Fig. 1) (Spurny, 1989). No separate waste dumps for asbestos and asbestos-containing materials exist as yet.

Fig. 1. A corroded and weathered asbestos shingle roof.

Measurements showed that the highest ambient air concentrations exist in the vicinity of industrial emission sources [concentrations range between 100 to 3200 fibers (> 5 μm)/m³ determined by SEM]. Elevated concentrations (range 100 to 1300) were also found in ambient air near street crossings in urban areas and near waste dumps with asbestos waste. Near buildings with corroded asbestos-cement plate roofs and fa-