SHORT COMMUNICATION

SEPARATION OF PHOSPHINE FROM ODOR-PRODUCING IMPURITIES

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Phosphine produced from commercial preparations of aluminium phosphide has a typical odor variously described as resembling garlic, acetylene or decaying fish, and over many years textbooks have perpetuated the idea that the odor, even of acetylene, was due to phosphine. During tests on the toxicity of the fumigant to insects in flour we found that the characteristic odor was removed from the atmosphere without appreciable loss of phosphine itself (Bond and Dumas, 1967). Further work on purification of the fumigant has shown that the odor factor can be easily separated from phosphine by passing through the column of a gas chromatograph. The system used for this separation (Apiezon L on firebrick as described by Dumas, 1964) allowed phosphine to pass through the packing of the column and be collected at the exit. A 40 ml evacuated flask closed by a stopcock was placed at the exit and phosphine was drawn in as the signal from the thermistor detector indicated passage of the gas. The sample thus obtained was analysed in a second gas chromatograph (with increased sensitivity) employing an alkali flame ionization detector (Dumas, 1969) and although high levels of phosphine (up to 200 ppm) were present no odor was detectable. Analysis of the fumigant in the second gas chromatograph showed that the phosphine passed through the column and detector of the first instrument without alteration. This observation that very pure phosphine does not have any detectable odor agrees with similar observations made by E. Fluck (personal communication, 1973).

Phosphine is an outstanding fumigant for control of insects in stored products because of its ease of application, its great ability to penetrate into materials, its high toxicity and very low residue formation. The odor associated with the fumigant does have some practical value as a warning agent to indicate presence of toxic levels of the gas but it has no apparent effect on commodities except, perhaps, to alter the flavour of certain types of tobacco (Reif, 1972). Unfortunately the odor-producing principle appears to be irreversibly trapped on the packing of the column, so attempts to identify it have so far proved unsuccessful. A recent review by Fluck (1973), describing the extensive investigations which have been made on phosphine, indicates that purification can be achieved by fractional distillation and that molecular sieves have been used to remove acetylene. The present method, using gas chromatography, could be of value in investigations where small quantities of high purity phosphine are required.

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REFERENCES


