

The results of 24 hours' storage at room temperature (+20°C) show lower recoveries than storage at the other temperatures, but all agents could be verified in all sample materials except tabun in water, soil, grass and sand and sarin in grass. Tabun was found in percentages of applied amount ranging from 0.8 in polyester/cotton fabric to 15.5 in polyurethane foam with activated charcoal, sarin from 3.2 in soil to 64.7 in polyurethane foam with activated charcoal, soman from 1.4 in grass to 45.8 in polyurethane foam with activated charcoal, mustard gas from 2.9 in grass to 78.2 in polyester/cotton fabric and diisopropyl methylphosphonate from 2.7 in sand to 93.5 in water.

### Conclusions

Headspace gas chromatography in combination with a simple detection device such as flame ionization has been extensively tested in laboratory and field exercises and has proved to be an important additional tool in verification of alleged use of chemical warfare agents. A combination of headspace gas chromatography and mass spectrometry would have improved these results substantially. This means that headspace gas chromatography represents a useful technique for verification of alleged use of chemical weapons. This technique should be incorporated in the procedures to be followed by an international inspection team.

The exercises have shown that chemical agents can be identified in samples exposed to prevailing weather conditions for periods of up to 28 days. The main advantage of this technique is that no preliminary clean-up or preparation is necessary before analysis in the laboratory. The stability is dependent on the absorption properties of the different matrices. Absorption into polymers obviously protects the agent from degradation and improves the chances of a positive verification. The experiments showed that the results are dependent on the water content of the samples. The present information makes it possible to evaluate which sample material should be preferred.

After collection of samples, the vials are sealed and transported to the laboratory for analysis. The stability of the tested agents in 10 different matrices has shown that in most cases, no precautions in storing the samples should be necessary. However, it should be borne in mind that in all cases, the recoveries are higher when samples are stored at low temperatures. By taking precautions in storing the samples, the possibility of positive verification is enhanced.

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