

Internal Correspondence

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From: L. W. ANDERS

Subject: BACK-UP SECTION FOR OVM

Date: February 28, 1980

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A number of meetings have been held to define the best technique for providing back-up section on the OVM. It is known that the OVM has sampling limitations for quantitatively determining contaminant concentration in the environment. The sampling is diffusion controlled as long as the molecules are readily adsorbed when they reach the activated carbon wafer. When the contaminant molecules are readily adsorbed, the concentration gradient provides a constant driving force for the sampling process. The rate of diffusion is a well defined function depending on the molecular species as well as the temperature and pressure of the ambient atmosphere.

The rate of adsorption is not always faster than the rate of diffusion, and in this case the OVM sampling process becomes controlled by adsorption rather than diffusion. The rate of adsorption is a function of the amount of contaminant adsorbed on the carbon as well as the presence of other adsorbed materials. It also depends on environmental factors such as relative humidity and temperature. Because the rate of adsorption is a complex function of the above factors, it is difficult to define. Therefore, during an OVM sampling period, it is difficult to define the upper exposure limits above which the rate of adsorption is equal to or greater than the rate of diffusion; in other words, when the OVM sampling becomes controlled by the adsorption process.

It has been demonstrated that the sampling rate of methylene chloride is dependent on the rate of adsorption over a wide range of relative humidity and is not diffusion controlled. When sampling a mixture of acetone and trichloroethane, the acetone sampling rate is dependent on the rate of adsorption very early in a sampling period. In fact, the trichloroethane can displace acetone collected early in a sampling period.

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With most sampling situations which have a mixture of contaminants, it is difficult to define the limits of diffusion controlled sampling. Therefore, it is necessary to provide a technique which determines when the primary wafer reaches a state where the rate of adsorption begins to control the sampling process.

The consensus of those attending the meetings was to provide a technique which would measure this limitation during the sampling period. It has been demonstrated that a secondary wafer placed behind the primary in a double-decker arrangement can provide a means to determine when the limit of diffusional sampling has been reached. This technique also extends the quantitative range of the diffusional sampling process. It was also the consensus of those attending that because of the simplicity, the double-decker is the most feasible design to provide a secondary wafer which will define the limits of the diffusional sampling process. With the simple geometry of the secondary diffusional chamber, the concentration gradient between the primary wafer and secondary wafer is one dimensional. This enables a simple definition of the rate of diffusion between the primary wafer and the secondary wafer. This design also allows the current monitor to be retained. This may be important because as customers define their limits of the diffusional sampling process, they may find that the current monitor would be sufficient for most of their sampling needs. Also, the double-decker is very easy to design and manufacture and could be accomplished in a very short time.

Therefore, I recommend we develop double-decker according to the following:

1. Build an aluminum prototype mold to produce a limited number of new parts to develop test data necessary to support sales to be completed by May 1.
2. Design and build single cavity mold for pilot production to be completed during the third quarter.

L. W. Anders
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