THE PRESENT STATUS OF AN INVESTIGATION OF AN ANIFACT OCCURRING AT LOW SAMPLING RATES WHEN SAMPLING PARTICULATE LEAD OXIDE OF SMALL PARTICLE SIZE WITH A MINE SAFETY APPLIANCES CO. TYPE ELECTROSTATIC PRECIPITATOR

The MSA electrostatic precipitator is generally operated at a sampling rate of 3 cfm. or 1 cfm. when used in the usual type of investigation of atmospheric constituents of the industrial environment. We have found an apparent decrease in efficiency at these rates when sampling the air in the human respiratory chamber at this Laboratory and we, therefore, use a sampling rate of 0.5 cfm., which is on the plateau of the sampling efficiency curve, as we determine it, for lead sesquioxide particles of .05 micron median size at the approximate concentration of .075 mg/M^3. The efficiency of precipitation is apparently a function of particle size and perhaps of concentration, and in all probability it is principally the extremely small size of the particles of lead sesquioxide in the chamber which makes this lower sampling rate necessary.

Recently we have changed the lead concentration in the chamber from .075 mg/M^3 to .15 mg/M^3 (determined at .5 cfm. sampling rate), and while we have not as yet determined the distribution of particle size at the new concentration we have no reason to believe it to be different from that observed at the concentration of .075 mg/M^3. Near the new concentration (.11 mg Pb/M^3) we ran a series of samples with the precipitator at rates below 0.5 cfm. and obtained fantastically high results at the lower sampling rates. A series of determinations were made at other concentrations below .15 mg/M^3 (determined at

0.5 cfm. sampling rate). The results are shown in Fig. (1). The individual and familial shape of the curves clearly indicates the presence of an artifact of consistent and uniform characteristics.

At this point of the investigation Mr. W. Younkers suggested that a possible explanation might be found to be related to the electric wind, set up in the sampling tube, which might cause a circulation of air into and out of the end of the sampling tube, deposition of lead taking place from the air being so circulated. Such an explanation seemed tenable. Mathematical treatment of the data of Fig. (1) assuming such circulation and a true concentration of lead in air as the asymptotic value for each setting indicated an effective circulation corresponding to complete lead recovery from approximately 7 liters of air per minute.

Tests were carried out using an extension on the sampling tube insulated from the charged sampling tube. The results to date do not show the artificial effect, and indeed the results are slightly lower than those obtained with the regular precipitator at 0.5 cfm. sampling rate.

We are continuing tests with modified precipitators, with precipitators in series, and with variable precipitator voltages. We are investigating further the decomposition of the TEL in the air line to the burner, the amount of TEL vapor given off at various flow rates and other methods of analysis for the room air. Previously to this investigation we tried chemical scrubbing methods for sampling, with poor success.

The suggested explanation, or something very similar to it, is probably correct but has as yet not been proved unequivocally. It may be said; however, that the true concentration can not be much different from the concentration obtained with the regular precipitator operated at 0.5 cfm. sampling rate.

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