to that used by May[4] in his study of the washout of *Lycopodium* spores.

The quantity of ^{131}I washed out is used to determine the washout coefficient (fraction scavenged per time) for the rain or snowfall, using the following formula:

$$\Lambda = Vy\Sigma c/QtA$$

where Λ is the washout coefficient; V, the wind speed at plume height; y, the distance between samplers; Σc, the total material collected in all samplers, less background; Q, the source release rate; t, the sampling time; A, the area of one sampler.

The sample collectors are 1-sq.-m dishes formed by attaching polyethylene sheets, with some slack, to large hoops made of plastic hose. Fifty to seventy of these are exposed on a line or arc transverse to the stack plume overhead. The collected rain or snow is gathered after a few hundredths of an inch have fallen. There appear to be no splash or residue problems with these simple basins.

The organic and inorganic radioiodine are separated from the melted snow or rain by standard chemical techniques which were modified to accommodate large volumes[5] and are counted in a high sensitivity γ-ray spectrometer[6].

Fig. 1 shows five coefficients for inorganic iodine measured in snowfall, three of these for columnar crystals and two for large, wet agglomerates of spatial dendritic crystals. If crystal size and type were constant in a snowfall, then washout should be linearly related to water-equivalent precipitation rate. Lines of unit slope have been drawn through the data. We assume that there is a family of lines, one for each crystal type, with the position of each line being determined by the velocity and surface area of the crystal.

Also shown are two coefficients measured in rainfall. These values are ten times the theoretical values for iodine vapour washout at these rainfall rates[2]. These measurements were made at different times and processed independently, thus providing a dual verification of the high values. Near the data points are drawn the theoretical washout rates when rain falls through plumes of 20μ and 40μ diameter water drops[2]. Electrical charges on the rain would increase the expected washout by an unknown amount.

Organic forms of radioiodine were scavenged only about 1 per cent as effectively as the inorganic forms, but there was too little captured to allow calculation of coefficients. The rapid scavenging of airborne inorganic radioiodine has been independently observed in condensate from air coolers[7]. Also, the scrubbing efficiency of spray towers for inorganic radioiodine increases with humidity, and Owe Berg attributes this to condensation phenomena[8].

These process stack plumes at the Hanford Atomic Plant contain sufficient water vapour to produce small water droplets when mixed with cold atmospheric air. Because there appears to be no alternative explanation, we conclude that nearly all the inorganic radioiodine gas is being captured during the water condensation process, as the stack gas mixes with the atmosphere, and that subsequent scavenging occurs at rates appropriate to tiny water drops.

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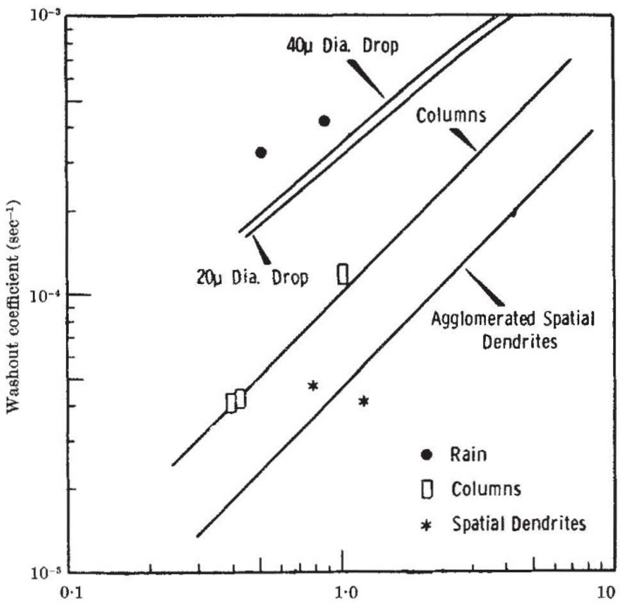

Fig. 1. Washout coefficients of inorganic iodine in process plant stack gases for rain and snow

Sub-millimetre Maser Amplification and Continuous Wave Emission

IN our investigations of molecular stimulated emission, we have recently observed amplification by direct current discharges in CN at a wave-length of 0·337 mm. We have also constructed continuous wave oscillator sources of the same wave-length using similar direct current discharges in an apparatus with a plane mirror resonant cavity and beam-splitter coupler as was described earlier[1]. The oscillator discharge tubes were 90 cm long and 5 cm in diameter and were operated under flow conditions, as with pulsed CN masers, at an equilibrium pressure of about 0·1 mm. Typically, the potential drop across the tube carrying a current of 1 amp was 800 V and output powers of the order of 0·1 W have been recorded. Similar results have been obtained using discharges run at 50 c/s. Amplification was observed by means of a similar discharge tube of length 60 cm in the resonant cavity of an independent pulsed CN maser. When a direct current discharge is used in this way, increases of up to a factor of two have been observed in the output power of the pulsed maser.

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Pinched Lightning Discharges

THE suggestion contained in my recent letter[1] that pinching out of the discharge may occur on a wide variety of scales from lightning to quasars led to a search of the literature to see if lightning current waves existed which