

(ABSTRACT) THE CO₂-CS₂ GEIGER COUNTER
AND ITS USE IN C¹⁴ DATING

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A complete description of the CO₂-CS₂ Geiger-counter system which is in operation at the University of Michigan Radiocarbon Dating Laboratory is available in mimeograph form, upon request to the author. It includes a report on research into the characteristics of the CO₂-CS₂ counter, as well as a full set of instructions and diagrams for the building of such a system for use in radiocarbon dating.

Some of the findings may be noted briefly as follows.

General characteristics: The electrons released by an ionizing particle become attached, probably to CS₂. The self-quenching action of the counter is excellent, in that no spurious counts are observed, in the absence of electronic quenching. However, a dead time of several milliseconds must be imposed electronically, because of the long interval during which the negative ions arrive at the anode.

Method: An electronic quench is used, which is triggered both by the CO₂-CS₂ counter and the anticoincidence ring. This serves to impose the required dead time, and also to prevent the firing of the CO₂-CS₂ counter by mesons.

Counter: The active part is 27/8 in. in diam. and 16 in. long, filled to 1 atmosphere, 95% CO₂ and 5% CS₂.

Experiments on characteristics: The plateau was measured to 1900 volts above threshold, and was found to be level to within 1% from 400 to 1600 volts above threshold. The maximum drift time of the negative ions was found to be about 9 milliseconds, with a sharp cutoff. Tests with various combinations of gas indicated, but did not prove, that the charge carrier was CS₂. The effects of common contaminants were determined. At voltages over 400 above threshold, 1% O₂ gave no detectable effect; 0.3% SO₂ gave a 2% to 3% reduction in counting rate. Extensive tests of the efficiency were made. Comparisons of the CO₂-CS₂ filling with an argon-ethane filling gave identical results within the experimental error. No basis was found for supposing that there was any failure of the CO₂-CS₂ counter to register counts.

Reliability, when used for dating: Data extending over a long period obtained with the system described have given no indication that there are variations in counting rate outside those expected on the basis of statistics.

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