U. S. Department of Commerce
Frederick B. Dent
Secretary

National Bureau of Standards
Richard W. Roberts, Director

National Bureau of Standards Certificate

Standard Reference Material 4247

Radioactivity Standard
Carbon-14

This Standard Reference Material consists of carbon-14-labelled sodium carbonate and carrier in approximately 5 grams of solution in a flame-sealed borosilicate glass ampoule. The carrier solution contains 2.12 grams of sodium carbonate per liter of 0.001 M sodium hydroxide, and its density is 0.999 ± 0.005 gram per milliliter at 22.4°C.

The activity in nuclear transformations per second per gram of solution in May, 1974, was

$$*3.66_5 \times 10^2 \pm 1.1_4\%*.$$

Three accurate dilutions of a master solution were made, gravimetrically, in the approximate ratios of 20:200:20,000, and a series of ampoules prepared from each dilution. Three ampoules from the intermediate dilution were used to prepare $^{14}CO_2$ samples, the activities of which were determined by measurements made with the National Bureau of Standards length-compensated internal gas counters; these measurements together with the appropriate dilution factor were used to derive the activity of this Standard Reference Material. The value of the activity for the series of ampoules of which this SRM is representative, has been corroborated by means of liquid-scintillation and ionization-chamber comparisons of this material with the first carbon-14-labelled sodium carbonate Standard Reference Material, 4924.

The uncertainty in the activity, 1.1_4 percent, is the linear sum of 0.3_4 percent, which is the limit of the random error at the 99-percent confidence level (i.e., 3.250 S_m, where S_m is the standard error computed from 10 measurements), and the estimated upper limit of conceivable systematic errors.

The material from which this Standard Reference Material was prepared was examined with anthracene and NaI(Tl)-spectrometer systems and no radioactive impurities were observed.

The recommended half life, 5730 ± 40 years, is the value adopted at the Fifth Radiocarbon Dating Conference, Cambridge, England, 1962 [Nature 195, 984 (1962)].

This Standard Reference Material was prepared and calibrated in the Center for Radiation Research, Radioactivity Section, W. B. Mann, Chief.

Washington, D. C. 20234
May, 1974

J. Paul Cali, Chief
Office of Standard Reference Materials