



The University of Georgia

Center for Applied Isotope Studies

RADIOCARBON ANALYSIS REPORT

June 23, 2017

Cyler Conrad
Department of Anthropology, MSC01-1040
University of New Mexico
Albuquerque, NM 87131-0001

Dear Mr. Conrad,

Enclosed please find the results of ^{14}C Radiocarbon analyses and Stable Isotope Ratio $\delta^{13}\text{C}$ analyses for the samples received by our laboratory on May 16, 2017.

UGAMS#	Sample #	Material	$\delta^{13}\text{C}, \text{‰}$	^{14}C age, years BP	\pm
29437	RC-1	charcoal	-25.39	3970	25
29438	RC-2	charcoal	-29.22	4060	25
29439	RC-3	charcoal	-25.20	4620	25
29440	RC-4	shell	-8.24	7300	30
29441	RC-5	shell	-8.00	7540	30
29442	RC-6	shell	-4.93	10680	30
29443	RC-7	burnt bone	-25.62	2850	25
29444	RC-8	bone	-16.59	6180	30
29445	RC-9	bone	-13.45	5900	25
29446	RC-10	bone	-14.39	9270	30
29447	RC-11	plant	-25.65	9140	30
29448	RC-12	shell	-8.68	9800	30
29449	RC-13	shell	-8.35	10510	30
29450	RC-14	shell	-8.34	11160	30
29451	RC-15	bone	-15.60	7460	30
29452	RC-16	bone	-9.85	8180	30
29453	RC-17	bone	-8.27	8100	30
29454	RC-18	bone	-4.36	9020	30
29455	RC-19	charcoal	n/a	n/a	n/a
29456	RC-20	charcoal	n/a	n/a	n/a

The charcoal was treated with 5% HCl at the temperature 80°C for 1 hour, then it was washed and with deionized water on

the fiberglass filter and rinsed with diluted NaOH to remove possible contamination by humic acids. After that the sample was treated with diluted HCL again, washed with deionized water and dried at 60°C. For accelerator mass spectrometry analysis the cleaned sample was combusted at 900°C in evacuated / sealed ampoules in the presence of CuO. The shell sample was treated with diluted HCl to remove any contamination from the surface. The washed and dried sample was treated in the vacuum with concentrated phosphoric acid to recover carbon dioxide. The bone was cleaned by wire brush and washed, using ultrasonic bath. After cleaning, the dried bone was gently crushed to small fragments. The crushed bone was treated with diluted 1N acetic acid to remove surface absorbed and secondary carbonates. Periodic evacuation insured that evolved carbon dioxide was removed from the interior of the sample fragments, and that fresh acid was allowed to reach even the interior micro-surfaces. The chemically cleaned sample was then reacted under vacuum with concentrated phosphoric acid to dissolve the bone mineral and release carbon dioxide from bioapatite. The resulting carbon dioxide was cryogenically purified from the other reaction products and catalytically converted to graphite using the method of Vogel et al. (1984) Nuclear Instruments and Methods in Physics Research B5, 289-293. Graphite $^{14}\text{C}/^{13}\text{C}$ ratios were measured using the CAIS 0.5 MeV accelerator mass spectrometer. The sample ratios were compared to the ratio measured from the Oxalic Acid I (NBS SRM 4990). The sample $^{13}\text{C}/^{12}\text{C}$ ratios were measured separately using a stable isotope ratio mass spectrometer and expressed as $\delta^{13}\text{C}$ with respect to PDB, with an error of less than 0.1‰. The quoted uncalibrated dates have been given in radiocarbon years before 1950 (years BP), using the ^{14}C half-life of 5568 years. The error is quoted as one standard deviation and reflects both statistical and experimental errors. The date has been corrected for isotope fractionation.



ISO/IEC 17025:2005

Sincerely,

Alexander Cherkinsky, Ph.D.
Senior Research Scientist



The University of Georgia

Center for Applied Isotope Studies

RADIOCARBON ANALYSIS REPORT

August 24, 2017

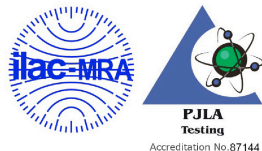
Cyler Conrad
Department of Anthropology, MSC01-1040
University of New Mexico
Albuquerque, NM 87131-0001

Dear Mr. Conrad,

Enclosed please find the results of ^{14}C Radiocarbon analyses and Stable Isotope Ratio $\delta^{13}\text{C}$ analyses for the samples received by our laboratory on August 2, 2017.

UGAMS#	Sample #	Material	$\delta^{13}\text{C}, \text{‰}$	^{14}C age, years BP	\pm
29455	RC-19	charcoal	-27.63	8300	30
29456	RC-20	charcoal	-24.73	9960	30

The charcoal was treated with 5% HCl at the temperature 80°C for 1 hour, then it was washed and with deionized water on the fiberglass filter and rinsed with diluted NaOH to remove possible contamination by humic acids. After that the sample was treated with diluted HCL again, washed with deionized water and dried at 60°C. For accelerator mass spectrometry analysis the cleaned sample was combusted at 900°C in evacuated / sealed ampoules in the presence of CuO. The resulting carbon dioxide was cryogenically purified from the other reaction products and catalytically converted to graphite using the method of Vogel et al. (1984) Nuclear Instruments and Methods in Physics Research B5, 289-293. Graphite $^{14}\text{C}/^{13}\text{C}$ ratios were measured using the CAIS 0.5 MeV accelerator mass spectrometer. The sample ratios were compared to the ratio measured from the Oxalic Acid I (NBS SRM 4990). The sample $^{13}\text{C}/^{12}\text{C}$ ratios were measured separately using a stable isotope ratio mass spectrometer and expressed as $\delta^{13}\text{C}$ with respect to PDB, with an error of less than 0.1‰. The quoted uncalibrated dates have been given in radiocarbon years before 1950 (years BP), using the ^{14}C half-life of 5568 years. The error is quoted as one standard deviation and reflects both statistical and experimental errors. The date has been corrected for isotope fractionation.



Sincerely,

Alexander Cherkinsky, Ph.D.
Senior Research Scientist

ISO/IEC 17025:2005



The University of Georgia

Center for Applied Isotope Studies

RADIOCARBON ANALYSIS REPORT

November 19, 2018

Cyler Conrad
Department of Anthropology, MSC01-1040
University of New Mexico
Albuquerque, NM 87131-0001

Dear Dr. Conrad,

Enclosed please find the results of ^{14}C Radiocarbon analyses and Stable Isotope Ratio $\delta^{13}\text{C}$ analyses for the samples received by our laboratory on November 5, 2018.

UGAMS#	Sample ID	Material	$\delta^{13}\text{C}, \text{‰}$	^{14}C age, years BP	\pm
38826	RC-24	rice spikelet	-26.39	280	20
38827	RC-25	rice spikelet	-24.51	220	20
38828	RC-26	rice spikelet	-26.39	220	20

The rice spikelet sample was treated with 5% HCl at the temperature 80°C for 1 hour, then it was washed and with deionized water on the fiberglass filter and rinsed with diluted NaOH to remove possible contamination by humic acids. After that the sample was treated with diluted HCL again, washed with deionized water and dried at 60°C. For accelerator mass spectrometry analysis the cleaned samples were combusted at 900°C in evacuated / sealed ampoules in the presence of CuO. The resulting carbon dioxide was cryogenically purified from the other reaction products and catalytically converted to graphite using the method of Vogel et al. (1984) Nuclear Instruments and Methods in Physics Research B5, 289-293. Graphite $^{14}\text{C}/^{13}\text{C}$ ratios were measured using the CAIS 0.5 MeV accelerator mass spectrometer. The sample ratios were compared to the ratio measured from the Oxalic Acid I (NBS SRM 4990). The sample $^{13}\text{C}/^{12}\text{C}$ ratios were measured separately using a stable isotope ratio mass spectrometer and expressed as $\delta^{13}\text{C}$ with respect to PDB, with an error of less than 0.1‰. The quoted uncalibrated dates have been given in radiocarbon years before 1950 (years BP), using the ^{14}C half-life of 5568 years. The error is quoted as one standard deviation and reflects both statistical and experimental errors. The date has been corrected for isotope fractionation.

Sincerely,

Alexander Cherkinsky, Ph.D.
Senior Research Scientist