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CARBONUS: Status report of the 14C dating facility at the University of Salamanca, Spain

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The ^{14}C dating facility at the University of Salamanca, based on the compact MICADAS (MIni CArbon DAting System) [1], has been in operation for over three years. This work presents a detailed status report on the facility's performance, sample preparation methodologies, and statistical validation of results.

A wide variety of materials have been processed, including collagen, corals, wood, charcoal and sediments. For sediments, different pretreatment methods are commonly used for ^{14}C dating, such as acid-alkali-acid (AAA), acid dissolution, and carbonate removal through fumigation [2]. In our facility, we have employed the fumigation method for sediment pretreatment, which has been proven effective for sample decontamination while preserving the integrity of the organic fraction. We present results obtained at different stages of method optimization, ensuring the highest accuracy and reproducibility. We describe the rigorous procedures to perform this pretreatment, including sediment homogenization to ensure consistent measurements. To ensure reliability, we perform three replicates of each sample, allowing us to detect potential issues such as poor homogenization, which is particularly challenging when dating organic carbon in sediments. Statistical analysis of replicates confirms high reproducibility, with deviations well within expected uncertainties, demonstrating not only the robustness of our methodology but also the precision and effectiveness of its implementation in our laboratory.

Overall, the facility has achieved an average background value of 42560 ± 4060 years B.P., reaching up to 50000 years after ion source cleaning. For standard samples, the facility has achieved average F14C values of 1.3407 ± 0.0026 for OxII, 0.2302 ± 0.0016 for IAEA C5, and 0.0031 ± 0.0013 for IAEA C9. Furthermore, we present results from the GIRI intercomparison samples [3] and collagen samples of known ages have been successfully dated, reinforcing the system's reliability. In conclusion, this article provides updated technical specifications of the AMS system, details on our quality control measures and results of the optimised fumigation method in our facility. These enhancements underscore the utility of this AMS facility for research in archaeology, geology, and climate science.

REFERENCES

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Abstract

This presentation presents a detailed status report on the facility's performance, sample preparation methodologies, and statistical validation of results. The laboratory, equipped with cutting-edge instrumentation, enables highly accurate and precise ^{14}C dating for a wide variety of sample types.

The talk provides an overview of the AMS system's technical configuration and the quality control procedures established to ensure the reliability of the results. It also presents analytical outcomes and the statistical methods applied to interpret the data. Furthermore, the main ^{14}C datings obtained to date will be discussed.

The validity of the method has been confirmed through the analysis of standards and reference samples of known age, previously measured in other internationally recognized dating laboratories.

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