

Performance report of the NTUAMS Lab during 2020-2024

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The AMS ^{14}C dating Lab (Lab code is NTUAMS) in the Department of Geosciences at the National Taiwan University was established in 2012 equipped with a 1.0 MV Tandemron Model 4110 BO-Accelerator Mass Spectrometer (AMS) made by High Voltage Engineering Europa B.V. (HVE) in Netherlands. Since 2013, the lab has been providing ^{14}C dating on organic and inorganic carbon samples including sediment and peat cores, stalagmites, foraminifera shells, bones, etc. We have built up three graphitization lines and a home-made semi-automatic EA-graphitization system for producing graphite. In order to avoid 2Li^+ interference, the AMS is running $^{14}\text{C}^{3+}$ mode with a transmission rate of 18% instead of $^{14}\text{C}^{2+}$ which has a transmission rate of 48%. For each batch of samples, at least three OXII, three background samples (BKG made from anthracite for organic carbon and NTUB made from limestone for inorganic carbon) and two known-age inter-comparison samples (distributed by University of Glasgow) were measured together. This study presents a total of 5050 graphite targets measured during 2020~2024. The target numbers measured in 2020, 2021, 2022, 2023 and 2024 (four months) were 1356, 1357, 1164, 1159 and 435, respectively. From the data results, the summaries of OXII, BKG, NTUB, inter-comparison samples are given. The AMS has a blank $^{14}\text{C}/^{12}\text{C}$ ratio between $5\text{e-}16$ and $2\text{e-}15$. The $^{14}\text{C}/^{12}\text{C}$ ratios of OXII, BKG and NTUB are about $1.2\text{e-}12$, $6\text{e-}15$ and $4\text{e-}15$, respectively. The measured ages of the inter-comparison samples agree well with their consensus values. A recent study of our lab on a known historic archaeological site in central China illustrates that the ^{14}C ages of bone collagen and charcoal samples not only agree well with the late Shang dynasty, but also time difference from the two sub-sites in the area. With our reliable ^{14}C dating facility, many applications in geology, archaeology, environment and synthetic industry have been done.

Keywords: NTUAMS Lab, standard and background, inter-comparison samples, semi-automatic graphitization system, applications