Geophysical Research Abstracts,
Vol. 11, EGU2009-9312, 2009
EGU General Assembly 2009


# Closed tubes preparation of graphite for high-precision AMS radiocarbon analysis

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Radiocarbon dating is an established tool applied in Geochronology. Technical developments of Accelerator Mass Spectrometry AMS, which allow measurements of samples containing less than 1 mg of carbon, opened opportunities for new applications. Moreover, high resolution records of the past changes require high-resolution chronologies i.e. sampling for 14C dating. In result, the field of applications is rapidly expanding and number of radiocarbon analysis is growing rapidly. Nowadays dedicated 14C AMS machines have great capacity for analysis but in order to keep up with the demand for analysis and provide the results as fast as possible a very efficient way of sample preparation is required. Sample preparation for 14C AMS analysis consists of two steps: separation of relevant carbon from the sample material (removing contamination) and preparation of graphite for AMS analysis. The last step usually involves reaction of CO2 with H2, in the presence of metal catalyst (Fe or Co) of specific mesh size heated to 550-625ºC, as originally suggested by Vogel et al. (1984). Various graphitization systems have been built in order to fulfil the requirement of sample quality needed for high-precision radiocarbon data. In the early 90ties another method has been proposed (Vogel 1992) and applied by few laboratories mainly for environmental or biomedical samples. This method uses TiH2 as a source of H2 and can be easily and flexibly applied to produce graphite. Sample of CO2 is frozen in to the tube containing pre-conditioned Zn/TiH2 and Fe catalyst. Torch sealed tubes are then placed in the stepwise heated oven at 500/550ºC and left to react for several hours. The greatest problem is the lack of control of the reaction completeness and considerable fractionation. However, recently reported results (Xu et al. 2007) suggest that high precision dating using graphite produced in closed tubes might be possible. We will present results of radiocarbon dating of the set of standards and secondary IAEA standards to demonstrate to what level this method can be used for high precision radiocarbon dating.

References

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