

CoIRICH

¹⁴C dating by Accelerator Mass Spectrometry

RESEARCH ACTIVITY

Accelerator Mass Spectrometry (AMS), and the correlated sample preparation techniques are developed at LABEC in order to date archaeological finds or works of art using the radiocarbon (¹⁴C) method. With AMS, a selective sensitivity is achieved of one part over a million of billions, corresponding to the ¹⁴C residual concentration in finds dating back to about 50 thousand years ago. The quantity of the material required to perform these measurements is typically a few milligrams at most.

RESEARCH GROUP

Istituto Nazionale di Fisica Nucleare (INFN)– Sezione di Firenze – Laboratorio LABEC



The Tandem accelerator at LABEC



The frock of St. Francis kept in Cortona, and the Artemidorus papyrus, both dated at LABEC by measuring ¹⁴C residual concentration by AMS

RESULTS/PRODUCTS

Since 2003, when the new Tandem accelerator has been available at LABEC, the beamline to detect rare isotopes (among which ¹⁴C) has been installed, as well as a dedicated laboratory for sample preparation, where specific pre-treatments are developed to remove any possible contamination from the materials to be dated. International intercomparisons have shown the level of excellence of the laboratory in this field

APPLICATIONS PERFORMED

On average, about 250 samples are measured per year, of many different kinds of materials (bones, seeds, charcoal, wood, cloths), in collaboration with University archaeologists, public Institutions for Cultural Heritage conservation, private Foundations. Among the most relevant examined cases can be quoted the dating of St. Francis' relics kept in Florence and Cortona, of the Artemidorus papyrus, of the Rosano Crucifix, of the icon from Ara-Coeli, of Etruscan tombs in the archaeological area of Baratti-Populonia (Tuscany)

RESEARCH ACTIVITY

- Development of luminescence dosimetry techniques in archaeological dating.
- Basic study of the luminescence properties of natural quartz and glass
- Study and characterisation of geoarchaeological sediments
- Dating of archaeological ceramics and bricks, burnt flints, clay-cores, mosaic glasses, archaeometallurgical slags, archaeological layers, palaeosoils ...
- Surface dating
- Authenticity tests

RESEARCH GROUP

CUDaM, Centro Universitario per le datazioni di Milano Bicocca, Milano



Lupa Capitolina: TL Dating of 24 clay-cores demonstrated that the casting of the statue occurred between 11th and 14th century AD.

RESULTS

The activity of the Luminescence laboratory started in 1980, and is documented in a number of publications and reports at various national and international Conferences and Meetings. The participation to international intercomparison projects constantly guarantees the reliability of the laboratory protocols and the correctness of the internal calibration procedures.

APPLICATIONS

Since 1980, several thousands of archaeological ceramics and bricks have been dated. Besides archaeological excavation, the study of the building chronology of historical monuments is of particular interest (Certosa di Pavia, Roman architecture in Milano, Early Medieval religious architecture in northern France and Northern Italy...) The dating activity abroad is mainly developed in the frame of international projects (Ecuador, Mexico, Belize, Sierra Leon, Mali, Lybia, Egypt, Morocco, Sudan, Oman, Yemen, Spain, France, Germany, Slovenia, Albania, Iran, Pakistan, Nepal, Thailand, Vietnam, China, Indonesia...)