University of Natural Resources and Applied Life Sciences Vienna - Institute of Physics and Materials Science

The Institute of Physics and Materials Science is specialized in characterization of biological and bio-based material including a variety of techniques and fields of application. One of them is the determination of age.

Brief description/core competencies

Chemical changes over time can be used to describe various processes. Provided these changes are slow and uniform, it is possible to use the taphonomic behavior as a chronometric clock to predict age.

Wood: Dating models have been created for spruce, fir, larch and oak. Different storage conditions, different species/genera and the extension of the existing models in time and spatial validity are the focus of current research.

Charcoal: delineation of the factors of pyrolysis conditions and aging processes is critical to long-term stability. The study of traditional charcoal processes provides the means to separate the two effects. Degree of pyrolysis, as well as elemental composition, can be predicted from infrared spectra. Aging processes lead to specific chemical changes over time. Therefore, different epochs can be separated from each other. Further investigations aim at the improved description of pyrolysis processes, as well as the development of dating models.

Straw: dating of straw as an aggregate in clay bricks, clay plasters and similar construction methods; investigation of various influencing factors, such as storage and construction method.

Hair, bone, tooth: aging studies.

Expertise (incl. instrumental equipment)

The working group "Material Aging in the Environment" has been actively involved in the characterization of aging processes in various issues for many years. Interdisciplinarity plays a major role in our research. For this purpose, we maintain numerous national and international contacts, which give us access to various materials. There is a close collaboration with other working groups at the Institute, especially the group 'Materials characterization at the nanoscale', that is specialized', among other things, in the study of nanostructure, nanoporosity and nanocrystallinity. The results are significant in building research, material characterization as well as in archaeology. These physical properties form complementary information to the molecular composition, which changes in the course of aging processes. Instrumental equipment (used for Heritage Science questions):

- Infrared spectroscopy - measurement in the mid (KBr pressling technique and ATR) and near (fiber probe and hyperspectral imaging) infrared.
- SEM incl. EDX, low-vacuum mode and ESEM
- Wide angle X-ray diffraction (WAXD = 2D XRD) and Small angle X-ray scattering (SAXS)
- Expertise in Synchrotron based experiments
- New development of new X-ray color camera especially suited for cultural heritage research
- Expertise with Simultaneous Thermal Analysis for complex material characterization

Contact

Website https://boku.ac.at/map/physik/arbeitsbereiche/materialalterung-in-der-umwelt

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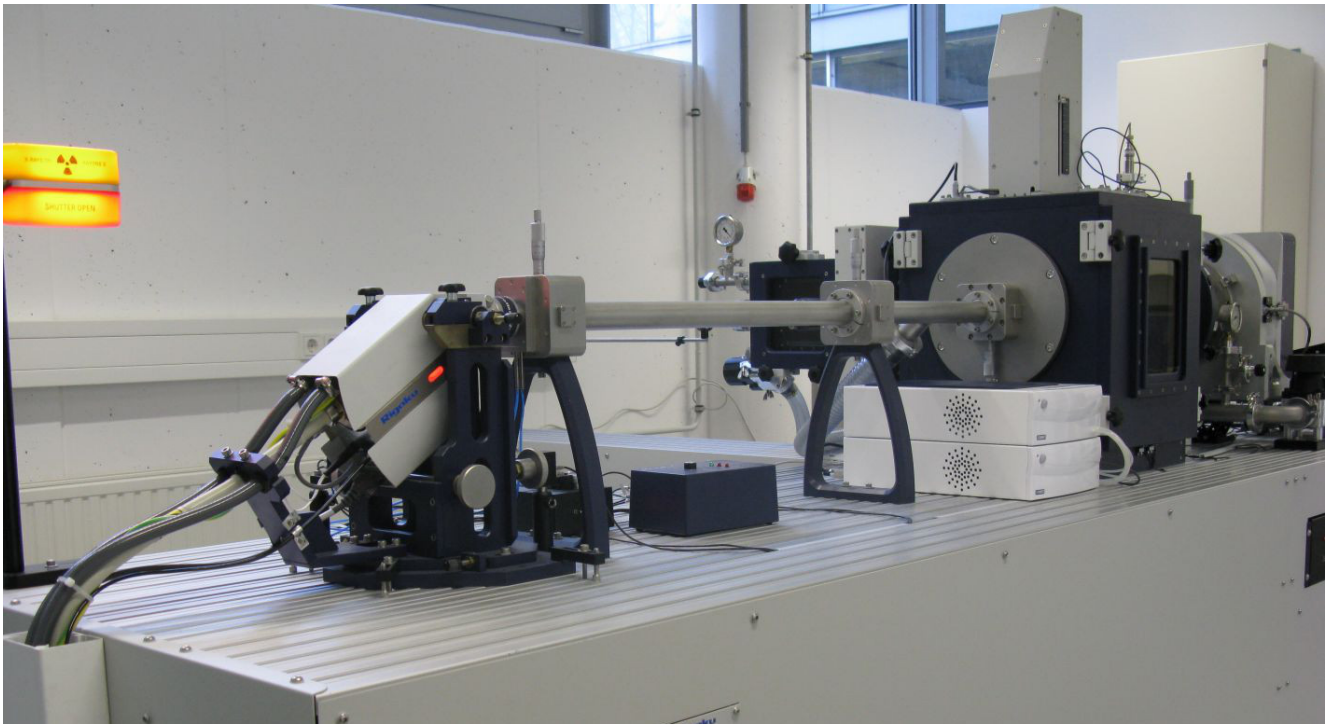
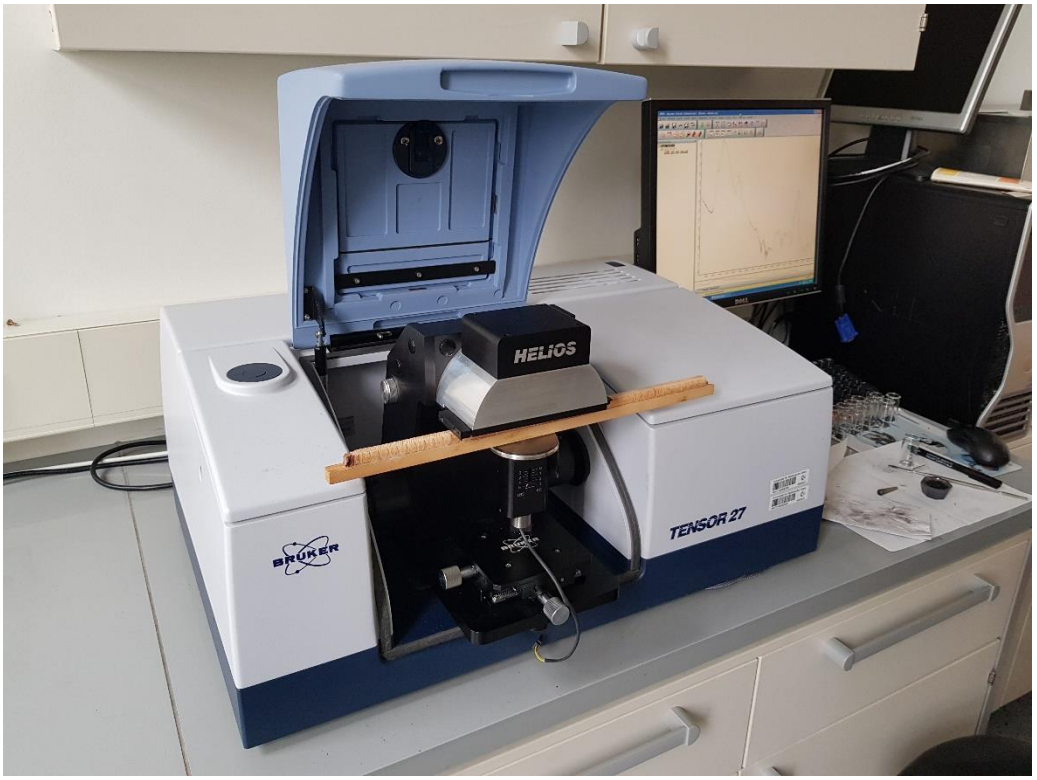
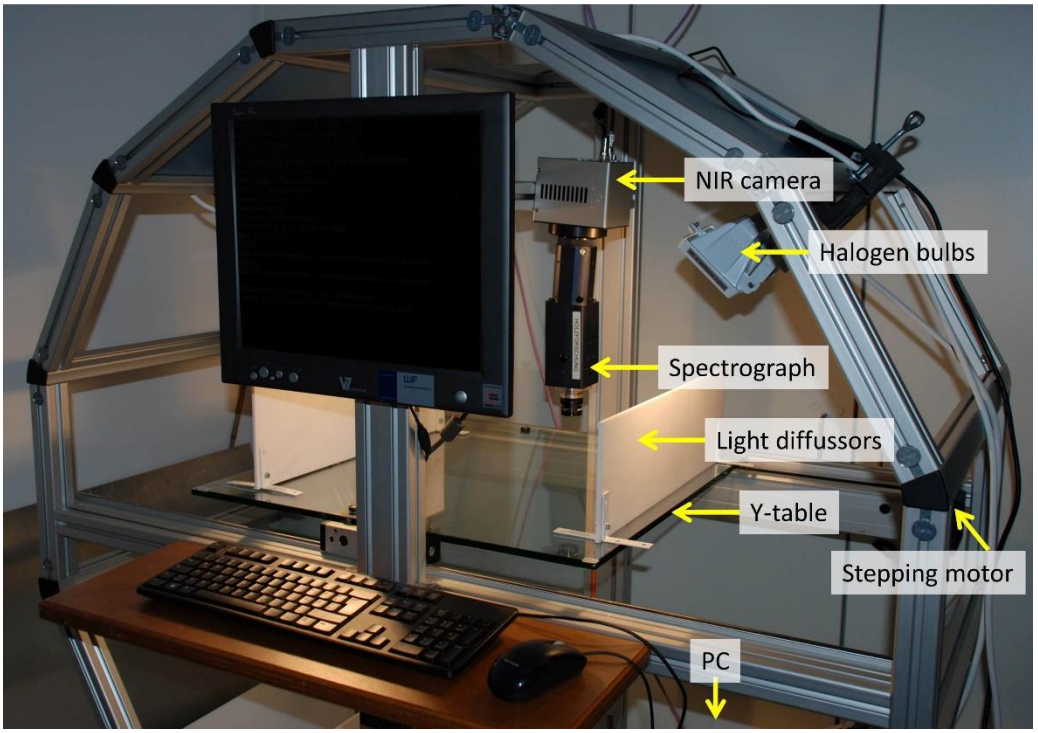


Small angel X-ray scattering (SAXS)



ATR-FTIR spectroscopy with clamped wood sample and prepared charcoal samples



Hyperspectral-Imaging - Systemdescription

ESEM w. EDX