

Study of the soil biodegradation on vegetable-tanned and chrome-tanned leathers - a tool for characterising of archaeological leather

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Many remains of ancient clothing, footwear and utensils made from leather have been found in archaeological sites throughout the world. The appropriate conservation treatment for these artefacts, in order to protect their integrity and scientific value, requires the understanding of leather structure as well as its deterioration under burial medium, wet or dry conditions. Historical leather and parchment were subject of international research projects (STEP, Environmnet, I.D.A.P) but any complex research was dedicated to archaeological leathers although that is very often and mainly very sensitive material with susceptibility for wrong handling. In case of archaeological leathers (contrary to historical leather and parchment), mechanisms of degradation have not been researched yet and almost none studies were published.

Wide range of methods (generally used for analysis of historical leather and parchment) have been employed to assess degradation processes and changes occurring in buried archaeological leather.

Infrared spectroscopy (FTIR) is widely used for historical collagen-based materials investigation, enabling the detection of conformational changes of collagen on deterioration, as well as the identification of materials added during the manufacturing process or formed on ageing. Thermal methods as DSC, TG or MHT are used for determination of hydrothermal stability and evaluation of decay collagen substrate.

Mechanical testing is done for comparison of strength and elongation changes influenced by degradation processes. Chemical analysis (e.g. determination of extractible substances, total ash or nitrogen content etc.) is generally used in leather industry for evaluation of the leather quality. Determination of pH is used for asses of free acids as progress of acid hydrolysis in collagen substrate. Stereomicroscopy and SEM is used for observing of the morphological changes. EDX was used for determination of the elements adsorbed from soil.

The aim of the study is to bring some new knowledge about mechanisms of leather biodegradation ongoing in soil environment and find useful methods for evaluation of degradation level of archaeological leathers in conservation practice. In contrary to leathers from the air environment which are influenced by pollutants, temperature and relative humidity fluctuation, archaeological leathers are influenced mainly by (micro)biocenosis

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