

Developing the use of supercritical fluids in archaeological sciences

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While they have been used extensively in industry, supercritical fluids have not yet been fully explored in the field of archaeological sciences. There are only few documented applications which are mostly related to cleaning, drying, and conservation of delicate archaeological artefacts: actively eroding iron objects, silk textiles and paper from historical records have been cleaned and stabilised using supercritical CO₂; supercritical fluids have also been used to dry waterlogged corks or other wooden materials; a further two publications have focused on the use of supercritical fluids prior to radiocarbon dating.

Here, I will briefly review these applications and present the results of two recent pilot studies. We successfully optimised a procedure using supercritical fluids to extract lipids from a broad range of archaeological ceramic fragments without having to powder them [1]. We also successfully removed conservation materials and soil contaminants from archaeological bones prior to radiocarbon dating using supercritical fluids [2]. Results obtained on both sets of samples show that supercritical fluids can provide a more efficient and greener alternative to liquid solvents for the non-destructive extraction of organic materials from archaeological artefacts and contribute significantly to a range of research questions in archaeological sciences.

[1] Devièse T, Van Ham-Meert A, Hare V, Lundy J, Hommel P, Ivanovich Bazaliiskii V and Orton J (2018). "Supercritical fluids for higher extraction yields of lipids from archaeological ceramics." *Analytical Chemistry* 90(4): 2420–2424.

[2] Devièse T, Ribechini E, Querci D and Higham T (2019). "Assessing the efficiency of supercritical fluid extraction for the decontamination of archaeological bones prior to radiocarbon dating." *Analyst* 144: 6128-6135.

