New methodology using femtosecond laser ablation ICP-MS for direct U-series disequilibrium dating of ostrich eggshell fragments

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Résumé

During the Middle Stone Age in South Africa, anatomically modern humans developed complex behaviors involving symbols and art. Huge efforts have been done for establishing the chronology of the emergence and spreading of these behaviors. However, the time range is over the limits of the C14 dating, and the complexity of the sedimentary deposits results in methodological issues for luminescence dating. In order to enrich the chronological tools, we have adapted the U-series disequilibrium dating method applied to ostrich eggshell fragments: a new protocol for direct isotopic measurement with femtosecond laser ablation ICP-MS has been developed. This method only necessitates a few milligrams of matter, making it usable on very small fragments. Moreover, it does not require heavy chemical preparation and is efficient even for low concentration (ppb) of uranium. Therefore this method opens new possibilities for absolute dating and chronological studies. Here, we present our protocol, as well as noticeable considerations on sample conservation and uranium uptake and leaching phenomena.

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