Appendix 1. LA-ICPMS operating conditions and data acquisition parameters

Laser ablation system	**New Wave Research NWR213 solid state Nd:YAG laser with aperture imaging**
Laser wavelength	213 nm (Nd:YAG)
Laser mode	Q-switched (Nd:YAG)
Nominal pulse width	4 ns (Nd:YAG)
Repetition rate	5 Hz
Spot sizes (diameter)	25 µm (analyses)
Energy density on sample	3.2-3.3 J/cm^2 (homogenized energy distribution)
Ablation cell	standard TV2 cell with custom sample holder
Ablation cell gas flow rates	453-544 ml/min He
Tubing for gas flow	Tygon S3 B44-3 and S-50 HL
Laser beam focus	Fixed at sample surface

ICP-MS	**Thermo-Fisher Scientific ELEMENT 2 double-focusing magnetic sector-field ICP-MS**
Interface cones	Ni jet sampler, H-type skimmer (Jet interface pump system)
Detector type	single-collector discrete dynode electron multiplier
Detector mode	cross-calibrated pulse counting and analogue
Detector vacuum	10^{-7} mbar (during analysis)
Mass resolution	300 (low resolution)
Scan type	E-scan
Detection mode	Both
Integration type	Average
Aquisition mode	Time resolved analysis
Argon gas flow rates (l/min):	
Plasma	16
Auxiliary	0.75
Sample	0.809-0.901
RF power	1400 W
Lenses (V):	
Extraction	-2000
Focus	-918
X-Deflection	1.60
Y-Deflection	-3.50
Shape	120
SEM potential	2500 V

Data acquisition parameters for U-Th-Pb dating	
Isotopes measured (sampling time in brackets) for U-Th-Pb	^{202}Hg (10), Mass 204 (^{204}Hg + ^{204}Pb) (20), ^{206}Pb (10), ^{207}Pb (50), ^{208}Pb (10), ^{232}Th (10), ^{238}U (50)
Settling times	1 ms (magnet fixed on ^{202}Hg)
Search & integration window	4 %
Samples per peak	100
Oxide production rate	Tuned to ≤ 0.03% UO_2 ($^{254}UO_2/^{238}U$)
Analysis duration	30 s. blank, 40 s. ablation, 40 s. washout.
Processing software	Iolite v. 2.5 (Hellstrom et al. 2008) including VizualAge DRS (Petrus & Kamber, 2012)
External standardisation	GJ-1 (Jackson et al. 2004) as primary standard. Zircon Plesovice (Slama et al. 2008), apatite McClure (Schoene and Bowring, 2006) and apatite Durango (Chew et al. 2011) measured for quality control.
Internal standard isotope	^{238}U