

Shock-origin of the Largest Ureilitic Microdiamond: Structural Observations and $\delta^{13}\text{C}$ Value

O. Christ, A. Barbaro, G. Bragaggia, S. Gross, E. Thomassot, M.C. Domeneghetti, M. Alvaro, F.E. Brenker, F. Nestola

Supplementary Information

The Supplementary Information includes:

- Table S-1
- Figures S-1, S-2 and S-3
- Supplementary Information References

Supplementary Tables

Table S-1 Carbon isotope measurement of reference materials and samples performed by secondary Ion Mass spectrometry. The instrumental mass fractionation (IMF) has been determined using 4 diamonds previously characterized by Isotopic ratio mass spectrometry after diamond combustion. The global error on individual $\delta^{13}\text{C}$ values corresponds to the quadratic sum of the internal error (i.e. the counting statistics over 30 cycles for each data point) that is better than 0.07 ‰ and the calibration error (i.e. the standard error of IMF determined with the four reference materials).

	Analysis Name	Chamber pressure [torr]	Primary Intensity [nA]	¹² C [count/s]	¹³ C [count/s]	raw $\delta^{13}\text{C}$ (vs PDB) [‰ vs PDB]	Internal error 1s	IMF [‰]	IMF (mean) [‰]	External error 1s	$\delta^{13}\text{C}$ corrected from IMF [‰ vs PDB]	global error 1s
Reference material:												
Jw00-1: $\delta^{13}\text{C}$ = -5.27‰, Thomassot <i>et al.</i> (2009)	Jw00 1@1	1.95E-09	2.61	3.45E+08	3.97E+06	-36.26	0.05	30.99	-			
	Jw00 1@2	1.95E-09	2.62	3.45E+08	3.96E+06	-36.26	0.03	30.99	-			
	Jw00 1@3	1.94E-09	2.61	3.44E+08	3.95E+06	-36.20	0.04	30.93	-			
	Jw00 1@4	1.94E-09	2.59	3.42E+08	3.93E+06	-36.44	0.04	31.17	-			
	Jw00 1@5	1.94E-09	2.58	3.42E+08	3.93E+06	-36.22	0.04	30.95	-31.00			
Db418: $\delta^{13}\text{C}$ = -5.32‰, Cartigny <i>et al.</i> (1997)	Db418@1	1.91E-09	2.58	3.21E+08	3.69E+06	-37.15	0.04	31.83	-			
	Db418@2	1.92E-09	2.57	3.20E+08	3.68E+06	-37.11	0.05	31.79	-31.81			
Db342: $\delta^{13}\text{C}$ = -10.25‰, Cartigny <i>et al.</i> (1997)	Db342@1	1.92E-09	2.58	3.19E+08	3.66E+06	-41.21	0.05	30.96	-			
	Db342@2	1.95E-09	2.6	3.27E+08	3.74E+06	-41.25	0.05	31.00	-30.98			
Kp13: $\delta^{13}\text{C}$ =- 5.11‰, Thomassot <i>et al.</i> (2007)	Kp13@1	1.93E-09	2.57	3.50E+08	4.02E+06	-35.89	0.04	30.78	-			
	Kp13@2	1.9E-09	2.56	3.47E+08	3.98E+06	-36.02	0.04	30.91	-30.85			
	All ref material								-31.16	0.11		

Table S-1 *continued***Sample:**

NWA6871@1	1.93E-09	2.58	3.29E+08	3.79E+06	-33.90	0.05	-2.74	0.12
NWA6871@2	1.91E-09	2.56	3.25E+08	3.75E+06	-33.78	0.07	-2.62	0.13
NWA6871@3	1.93E-09	2.54	3.23E+08	3.73E+06	-33.90	0.05	-2.74	0.12
NWA6871@4	1.91E-09	2.55	3.34E+08	3.85E+06	-34.60	0.04	-3.44	0.11

Supplementary Figures

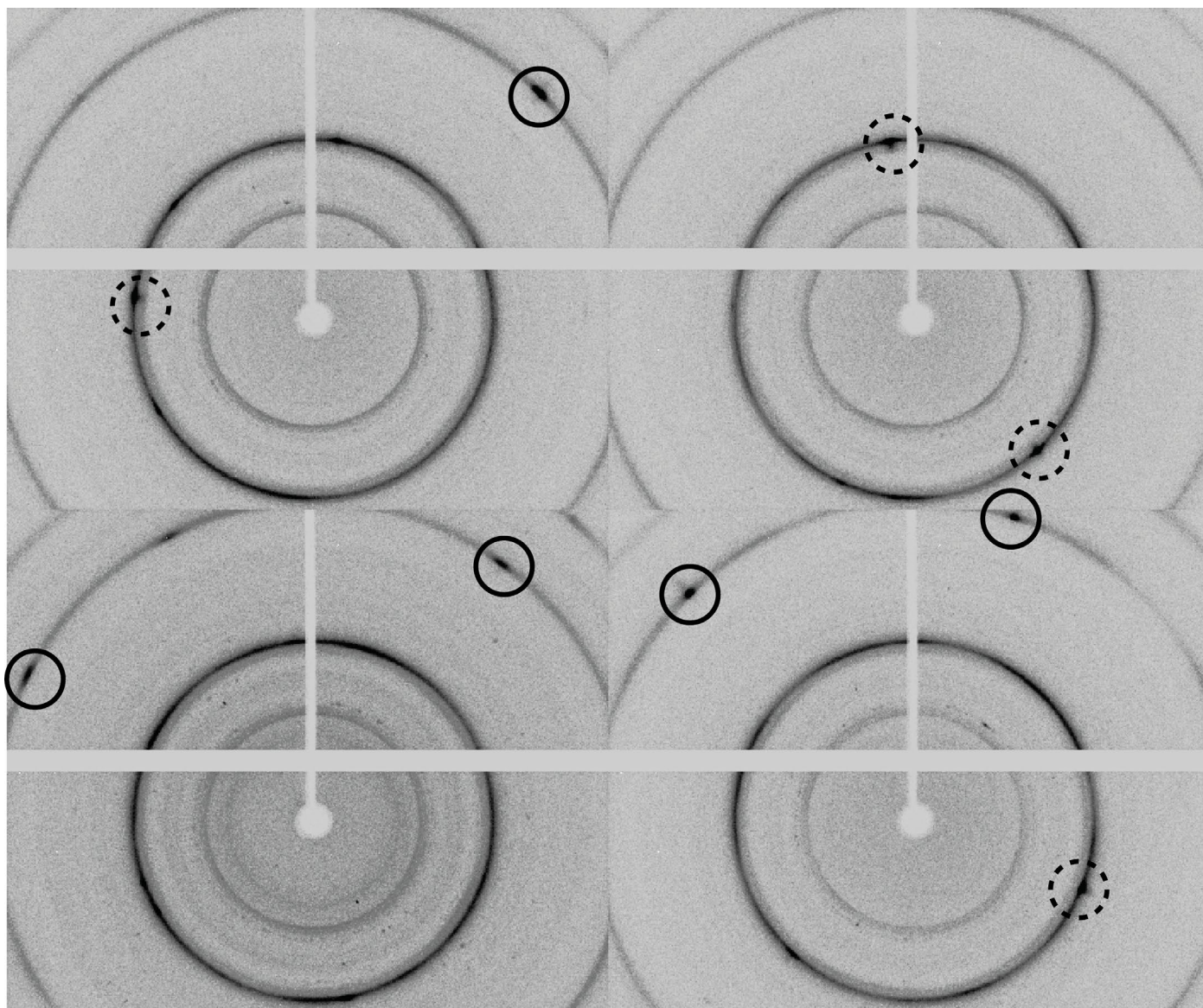


Figure S-1 Four exemplary diffraction images from the initial ϕ -run. The mentioned unusually large single crystal diffraction spots are marked with circles and dotted circles for diamond d -spacings of 1.26 Å and 2.06 Å, respectively.

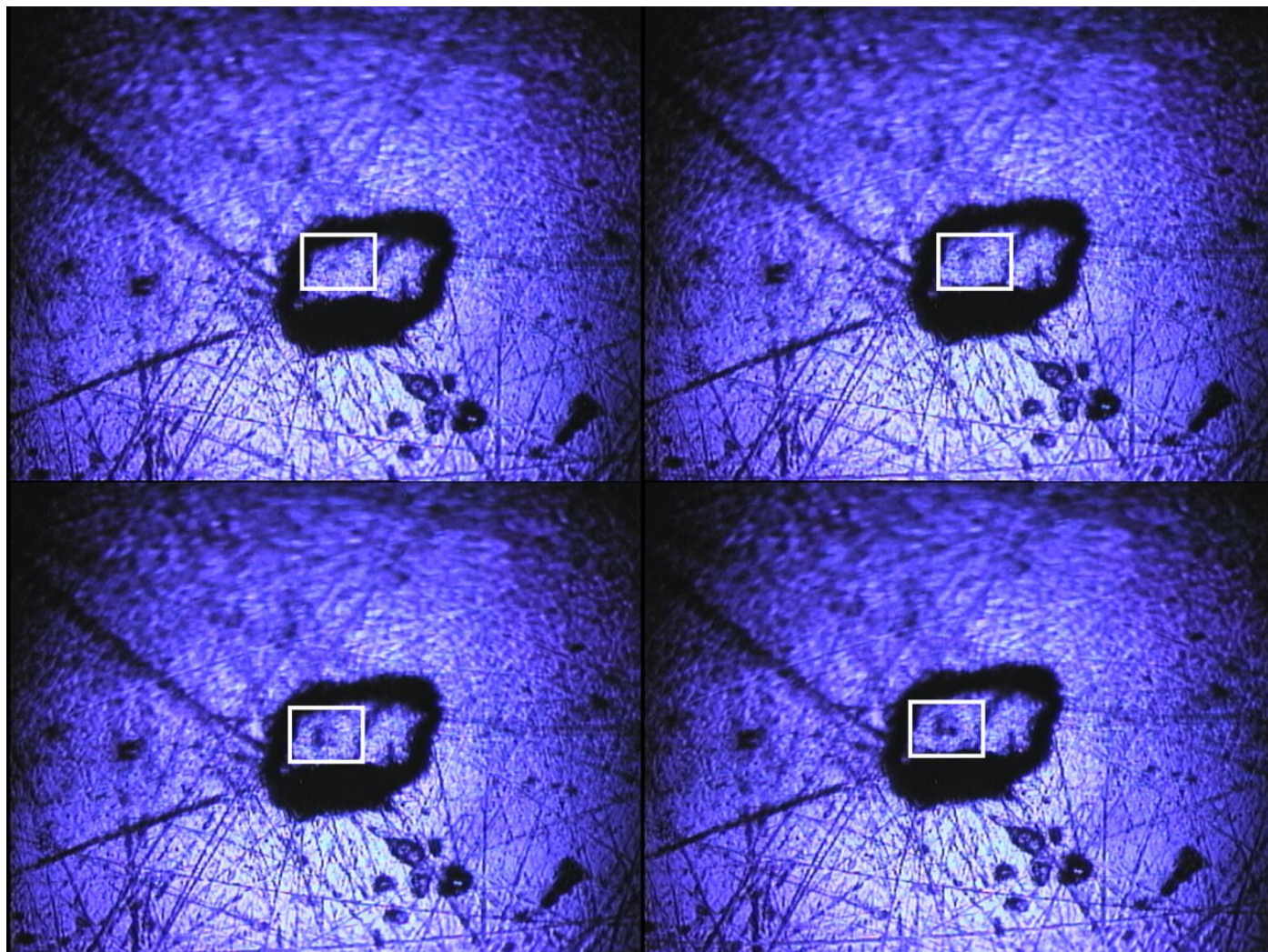


Figure S-2 The analysed grain embedded in indium paste. The white rectangle shows the location of the LG-SIMS measurement points, see the increasing number of dark spots in it.

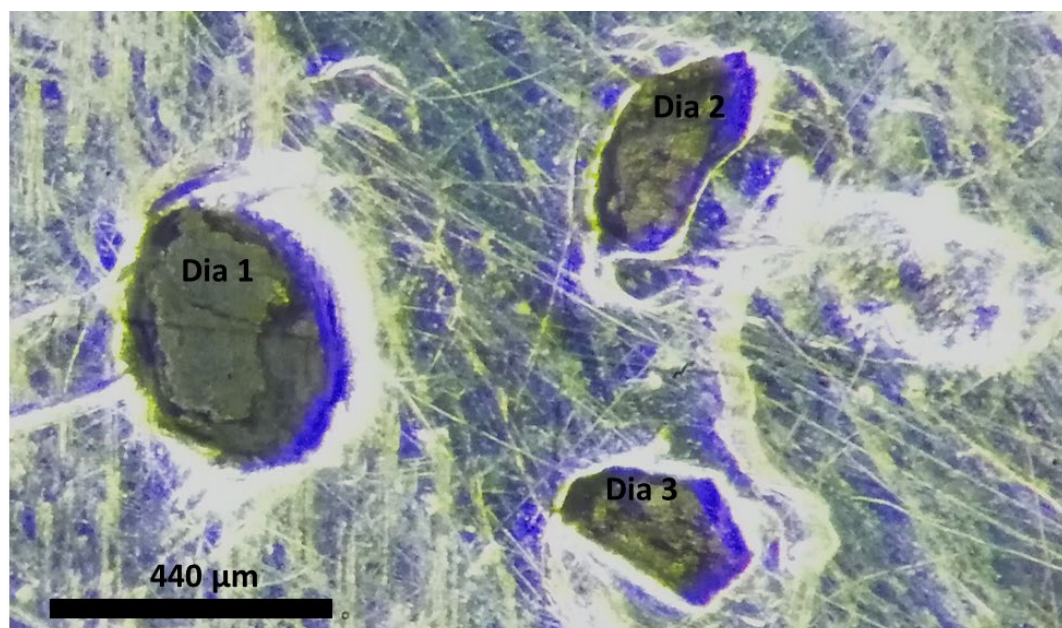


Figure S-3 Three microdiamonds from NWA 6871 in indium paste. Dia 1 is the same diamond, which is shown in Figure 1. Dia 2 and Dia 3 had irregular surfaces, making $\delta^{13}\text{C}$ measurements unreliable.

Supplementary Information References

- Cartigny, P. (1997) Concentration, composition isotopique et origine de l'azote dans le manteau terrestre (Concentration, Isotopic Composition, and Origin of Nitrogen in the Earth's Mantle). Paris, Paris Diderot University.
- Thomassot, E. (2007) Origine et formation des diamants dans le manteau supérieur terrestre: apport d'une systématique multi-isotopique (carbone, azote et soufre) (Origin and Formation of Diamonds in the Earth's Upper Mantle: Insights from a Multi-Isotopic Approach (Carbon, Nitrogen, and Sulfur)). Paris, Paris Diderot University.
- Thomassot, E., Cartigny, P., Harris, J.W., Lorand, J.P., Rollion-Bard, C., Chaussidon, M. (2009) Metasomatic diamond growth: A multi-isotope study (^{13}C , ^{15}N , ^{33}S , ^{34}S) of sulphide inclusions and their host diamonds from Jwaneng (Botswana). *Earth and Planetary Science Letters* 282, 79–90. <https://doi.org/10.1016/j.epsl.2009.03.001>