AN INVESTIGATION OF CARBON IN DAR AL GANI 319 POLYMICT UREILITE.
C. L. Smith[1], I. A. Franchi[2], M. M. Grady[1] and A. B. Verchovsky[2], [1]Department of Mineralogy, The Natural History Museum, London, SW7 5BD, U.K., [2]P.S.S.R.I., The Open University, Milton Keynes, Buckinghamshire, MK7 6AA, U.K. (C.L.Smith@nhm.ac.uk)

Introduction: The ureilite Dar al Gani 319 (DaG 319) is a polymict ureilite containing fragments and clasts of typical ureilite material, felsic lithic clasts, dark clasts containing phyllosilicates and sulphides, metal-rich clasts, chondrules and chondritic clasts and isolated mineral grains [1]. The multi-stage history of the polymict ureilites offers insight into the origin and formation of the ureilite parent body and later processes, such as fragmentation, shock and addition of 'exotic' components. We have analysed the abundance, isotopic composition and form of carbon within 'silicate' and 'dark clast' sub-samples of DaG 319 (BM2002, M27) using a combination of high-resolution stepped combustion and mass spectrometry. Analysis of a sample by stepped combustion allows for the identification of different carbon phases e.g. organic, graphitic, diamond, as each phase has characteristic combustion behaviour [e.g. 2]. By understanding the nature of carbon within this complex sample the role of carbon in ureilite petrogenesis may be better constrained.

Results and Discussion: *'Silicate'*: The total C yield is 2.2 wt% C, with a δ^{13}C of –4.0‰, similar to reported values for both polymict and monomict ureilites [2,3]. The C release profile is bimodal, with peaks at 650˚ and 800˚C. The maximum at 650˚C has a δ^{13}C value of –2.6‰ and is probably from combustion of graphite, the peak at 800˚C has a δ^{13}C value of –6.3‰, suggestive of diamond combustion or combustion of graphite with a higher crystallinity. Previous investigations indicate that ureilite diamond has an indistinguishable δ^{13}C composition from associated graphite [3]. The higher crystallinity graphite may be genetically related to the lower crystallinity phase with the difference in δ^{13}C attributable to isotope fractionation between fluid/graphite during graphite formation. Alternatively the different graphite components may be attributable to different phases (both ureilitic) within DaG 319. Taken individually both components fall into the reported ranges of δ^{13}C for ureilite graphite [2,3].

'Dark clast': The dark clast is petrographically similar to the dark clasts described previously [1]. The bulk C yield is 1.7wt% with a δ^{13}C of –17.2‰. Unlike typical ureilite material, the major C release occurs below 500˚C (1.1wt%) with a δ^{13}C of –16.9‰, which is similar to carbonaceous chondrite (CC) macromolecular material [e.g. 4]. Between ~600 and 850˚C 0.3wt% C is released with a δ^{13}C of –13.3‰ again similar to CC carbon [4,5]. Above 1000˚C, 0.3wt% C is released with a higher δ^{13}C value of +19‰, attributable to contribution from minor amounts of isotopically heavy SiC [5].

These results indicate that DaG is diverse in its C complement suggesting multiple sources and/or different petrogenetic processes. The silicate fraction implies isotope fractionation processes, during graphite or possibly diamond petrogenesis. The dark clast is likely CC in origin, indicating interaction between ureilite body (ies) and CC bodies, perhaps during impact-induced fragmentation of the ureilite parent. Carbonate, a characteristic phase within some CCs is absent, suggesting derivation from a carbonate-poor CC type e.g. CV, CO or CR.

References: [1] Ikeda Y. and Prinz M. (2001) *MAPS*, 36, 481-499. [2] Smith *et al*., (2001) *LPS XXXII,* #1878. [3] Grady M. M. *et al*., (1985) *GCA*, 49, 903-917. [4] Alexander C. M. O'D. *et al*., (1998) *MAPS*, 33, 603-622. [5] Grady M. M. (2002) *MAPS,* 37, 713-735.