

THE CARBON ISOTOPIC COMPOSITION OF NOVO UREI DIAMONDS. A.V.Fisenko, L.F. Semjenova, A.B. Verchovsky*, S.S. Russell* and C.T. Pillinger*. Vernadsky Institute, Moscow, Russia, *Dept. of Earth Sciences, The Open University, Milton Keynes, UK.

Herein we discuss the carbon isotopic composition of diamond grains isolated from the Novo Urei meteorite. A diamond separate was obtained from 2g of whole rock using the chemical treatments described in Fig. 1 aimed at obtaining very pure diamond. X-ray diffraction of the residue, which represented 5000 ppm of the parent mass, indicated only the presence of the desired mineral. The diamond crystals were 1 - 30 μm in diameter, and some grains had a yellow colour. The chemical treatments were followed by a size separation to give a 1 - 10 μm and a 5 - 30 μm fraction, which were named DNU-1 and DNU-2 respectively.

Carbon isotope measurements were performed on a VG SIRA 24 dynamic mass spectrometer capable of measuring $\delta^{13}\text{C}$ to $\pm 0.05\text{‰}$ precision using a stepped combustion technique. The results from the two size separates are shown in figure 2. Both samples gave total carbon yields of $\geq 95\%$, demonstrating they consist of a pure carbonaceous phase. The major carbon release ($\sim 90\%$ of the total carbon) was between 550°C to 650°C for DNU - 1 and $550 - 750^\circ\text{C}$ for DNU2. The narrower combustion peak, and lower mean release temperature of DNU - 1 can be attributed to the smaller grain size in this sample, a factor known to affect combustion temperature (Wright and Pillinger 1989). The average $\delta^{13}\text{C}$ values for carbon in the above mentioned temperature range was identical for both samples at $-1.9 \pm 0.1\text{‰}$. This value determines accurately an average carbon isotopic composition in Novo Urei diamonds. It differs by nearly 4‰ from the value defined by Vdovykin (1970) of -5.7‰ . The difference could be ascribed to a systematic error in the isotope measurement in one of the laboratories, but a more probably explanation may be that the diamond separate used for this study is of higher purity than samples previously analysed.

The $\delta^{13}\text{C}$ value is not constant for each temperature step of the experiment but varies by $\sim 3\text{‰}$ over the main carbon release. This is a puzzle in view of the supposed purity of the residue. The fluctuations may be due to the fractionation of the carbon isotopes during the crystallisation of the diamond. Alternatively, the diamond may be from a mixture of isotopically distinguishable sources. Further investigations are in progress to resolve this problem.

According to the data of Grady *et al.* (1985), the average $\delta^{13}\text{C}$ value of bulk Novo Urei is -2.8‰ over the temperature range of $500 - 700^\circ\text{C}$, 0.9% lighter than the measurements made by us. The similarity in isotopic composition suggests that the diamond is genetically linked to the rest of the carbonaceous material in the meteorite, although clearly carbon measurements of samples produced at each stage of the acid dissolution will be necessary to determine whether the carbonaceous phases are isotopically distinguishable.

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Figure 1

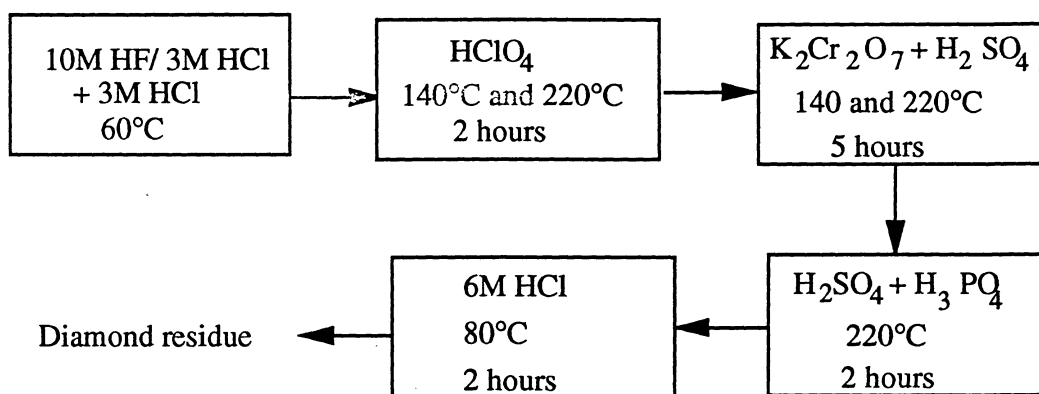


Figure 2

