STABLE ISOTOPES IN THE ORDINARY CHONDRITES: CHARACTERISATION OF ISOTOPICALLY ANOMALOUS PHASES. C.M.O'D Alexander[1], J.W. Arden[2], D. McGarvie[1], N. Schelhaas[3], U.Ott[3], I.P. Wright[1] and C.T. Pillinger[1]. (1) Planetary Sciences unit, Open University, Milton Keynes, U.K. (2) Dept. Earth Sciences, Oxford University, U.K.(3) Max- Plank-Institute Fur Chemie, Mainz, F.G.R.

The characterisation and identification of anomalous isotopic phases in the carbonaceous chondrites (1,2) allows a tantalising glimpse of the pre-history of solar nebula material. Noble gas studies of the ordinary chondrites (3,4) has shown that they also contain anomalous noble components with similar characteristics to those in the carbonaceous chondrites. From these results it has been inferred that $C\delta$ is present in some UOCs but so far $C\alpha$ and β have not been found. However, there is no C or N isotopic data to support the identification of $C\delta$ in the UOCs.

Stepped combustion of an HF/HCl residue of Semarkona enriched in the noble gas carriers (4) indicates there are two major carbonaceous phases both of -35 and -20 . Their $\delta^{15}N$ compositions appear to be very different but their super-position makes estimates of their absolute $\delta^{15}N$ compositions very difficult. However, one has a $\delta^{15}N$ of at least +70‰. The other phase that apparently combusts over a more limited temperature range, at about 450°C, has a $\delta^{15}N$ of less than -5 . Solvent extracted samples of Murray and Murchison carbonaceous chondrites exhibit very similar combustion profiles and isotopic compositions. The combustion profiles of Murray and Murchison have been interpreted as resulting from the combustion of a 'kerogen' and $C\delta$. That both $C\delta$ and the 'kerogen' are present in Semarkona and carbonaceous chondrites in similar proportions may be more than a coincidence. This 'kerogen' may also be one of the carriers of heavy hydrogen found in both carbonaceous and ordinary chondrites.

Bulk combustions of Semarkona, Krymka and Parnallee suggest there is a high temperature phase that combusts between 900 - 1000°C and has an isotopic composition that is enriched in ^{13}C and ^{15}N. Stepped combustion of the Semarkona residue has revealed a relatively broad high temperature release (700 - 1000°C) with a peak at 850°C and maximum $\delta^{13}C$ and $\delta^{15}N$ of 127 and 140‰ respectively. Although tentative this is the first reported instance of a correlation between heavy N and C. A third ^{15}N enriched component is also present in the residue of Semarkona with a combustion temperature of 650°C and $\delta^{15}N$ of 190‰. Acid residues of other UOCs have been prepared and are under study. In particular the residue of a large sample of Parnallee is being further processed to concentrate the various phases identified for detailed isotopic and TEM analysis.

The above results would seem to comfirm the presence of $C\delta$ in Semarkona inferred from noble gas work. However, evidence for $C\alpha$ and $C\beta$ has not been found. The presence of both $C\delta$ and 'kerogen' in the carbonaceous and ordinary chondrites has important implications for nebular processes. It has been suggested that the material from which the chondrites formed underwent fractionation during condensation of a hot nebula (5). It is unlikely either of these phases could have survived condensation. Therefore, either these phases were introduced after condensation or another mechanism for the fractionations observed in the chondrites is required. Similarly, it has derived from chondrules (6). Neither $C\delta$ nor the 'kerogen' are likely to have survived chondrule formation. Thus if the chondrules were the major source of rim-matrix material some material must have avoided the chondrule forming process.

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