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SOME STUDIES ON MAGNETIC EXTRACTS FROM UNEQUILIBRATED ORDINARY CHONDRITES

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Magnetic extracts from a suite of 12 unequilibrated ordinary chondrites have been examined by X-ray diffraction, electron microprobe and metallographic techniques. XRD patterns of U.O.C. differ markedly from equilibrated chondrites. The XRD patterns of equilibrated chondrites are dominated by peaks produced by α and γ nickel-iron, whose relative intensity varies between H,L and LL chondrites in the expected manner. In contrast, peaks due to α and γ are very weak or missing from the XRD patterns of the highly unequilibrated Semarkona and Krymka, although weak α reflections are present in the data for equally unequilibrated Bishunpur. A small proportion of the Bishunpur and Semarkona metal contains Si and is believed to have equilibrated at high temperatures and in the γ state, but evidently much was still equilibrating when it cooled into the α + γ field of the Ni-Fe phase diagram.

Although Wood (1962) claimed that XRD evidence indicated the presence of magnetite in Tieschitz, Sprengel-Segel (1968) was unable to confirm this using her Mössbauer data. All the U.O.C. contain peaks in their XRD patterns which we tentatively identify as due to magnetitê. This supports the recent speculation of Huss *et al*. (1980) that there is magnetite in the matrix, based on defocussed electron beam analysis. The presence of magnetite in U.O.C. is a strong argument against their formation at ~ 800K as advocated by Hutchison *et al*. (1979) and others.

We have also found carious forms of recrystallized kamacite. Jagged α_2, formed by massive transformation of γ, occurs in Bishunpur, Hedjaz, Manych, Sharps and, possibly, Tieschitz. Polycrystalline α (formed by annealing deformed α) occurs in Tieschitz, Sharps and Mezö-Madaras. The metal in several UOC contains regions of pearlite, suggesting the presence of carbon and fairly slow cooling from $\lesssim$ 500 °C. These regions are also P-rich and some α regions contain small precipitates, presumably of phosphide. The presence of pearlite and recrystallized α suggests that the sulfide mobilization was due to reheating, probably after agglomeration of the chondrites. Only three of our 12 UOC (Parnallee, Dhajala and Chainpur) contain no evidence of reheating. Most ordinary chondrites which have been studied for their reheating effects, have K-Ar ages ~ 500 Ma, whilst these UOC have ages ~ 4.6 Ga. It seems that either the event which caused the reheating was too mild to cause appreciable gas-loss or, more likely, occurred very early in solar system history. Maybe it was part of the agglomeration process.