Morse, A.D., Sears, D.W.G., Guimon, R.K., Hutchison, H., Wright, I.P., Alexander, C.O. and Pillinger, C.T. (1987) Secondary alteration history of type 3 ordinary chondrites. *Meteoritics*, **22**, 465-466.

SECONDARY ALTERATION HISTORY OF TYPE 3 ORDINARY CHONDRITES

A.D. Morse*, D.W.G. Sears*†, R.K. Guimon†, R. Hutchison +, I.P. Wright, C.O. Alexander*, and C.T. Pillinger*, **Planetary Sciences Unit, Open University, Milton Keynes MK7 6AA, UK; †Cosmochemistry Group, University of Arkansas, Fayetteville, AR 72701; +British Museum (Natural History), London, SW7 5BD, UK*

Metamorphism has obscured the nebula record of most ordinary chondrites, but a few type 3 ordinary chondrites have virtually escaped this form of secondary alteration (Dodd *et al.*, 1967). Type 3.0-3.2 have a number of unusual properties which could have been imparted before and/or during the nebular stage of solar system formation; e.g. they do not lie on the TL peak temperature-peak width trends defined by the higher types (Sears *et al.*, 1982) and they show very high deuterium enrichments (McNaughton *et al.*, 1983) and isotopic anomalies in nobler gases and carbon. Recently, indications of aqueous alteration have been observed in Semarkona (Hutchison *et al.*, 1985), in which case the water responsible may be the carrier of the heavy hydrogen; alternatively, it could be diluting an even higher deuterium signature elsewhere in the meteorite. Hydrothermal annealing experiments have shown that the TL properties of types 3.0-3.2 could be due to these types being aqueously altered (Guimon *et al.*, 1986). We have therefore undertaken a combined study of the TL properties hydrogen isotope composition and petrology of separated chondrules and matrix from several type 3.0-3.5 ordinary chondrites.

Chondrules and matrix samples were hand-picked under a low-powered binocular microscope. The samples were broken into three, a fragment being taken for each of TL, petrological and D/H Studies. To date, data have been obtained for eight Semarkona separates: TL measurements have been made on six porphyritic chondrules, a sample which is $\geq$ 70% fine-grained matrix and a chondrule-rim matrix sample consisting of concentric metal, sulphide and silicate structures, and D/H measurements have been made on two of these chondrules, the matrix sample and a bulk sample, and EMPA studies made on two chondrules.

All samples released water above 200°C which showed significant deuterium enrichments. In agreement with McNaughton *et al.* (1983), the bulk sample released 0.35% water with SD SMOW $>$ 1 000‰, while the two chondrules (porphyritic pyroxene, Fs 25-42, and porphyritic olivine-pyroxene, Fa 14, Fs 14) released $<$ 0.15% water with SD SMOW $>$ 1 000‰, and the matrix sample produced 0.4% water with SD SMOW of 600-700‰.