

## MAGNETITE MORPHOLOGIES IN THE ESSEBI AND HARIPURA CM CHONDRITES

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At the Fourteenth Lunar and Planetary Science Conference, there was discussion as to whether the unusual forms of magnetite common in the CI chondrites (See Nagy (1), e.g.) are also present in other carbonaceous chondrites. Though Jedwab (2) observed these interesting features in the CI chondrites he examined, he did not find them in the fourteen other carbonaceous chondrites he studied. However, Ramdohr (3) showed a micrograph illustrating that the CM Essebi and the CR Renazzo contain magnetite in 10-15  $\mu\text{m}$  aggregates of  $\mu\text{m}$ -sized grains. We therefore initiated a search for unusual magnetite forms in CM, CV and CO chondrites using scanning electron microscopy.

Our results on the magnetite observed in two CM chondrites are presented here. The samples studied were multiple small pieces, <5 mg each, of the meteorites. No pre-treatment was done except that the samples were coated with  $\sim 50 \text{ \AA}$  of Au-Pd. Important magnetite morphologies previously reported in CI chondrites were observed. Several grainy spheroids in the Haripura CM chondrite are shown in Fig. 1A-C. Kerridge suggests these structures closely resemble the radiating fibrous spherulites which are characteristic of some magnetite in the CI chondrites (personal communication). An example, 4.6  $\mu\text{m}$  in diameter, surrounded by 0.7  $\mu\text{m}$  malformed isometric crystals is shown in Fig. 1A. Iron is the only cation in all the features shown in Fig. 1A, including the oblong structure to the upper left of the spheroid, the spheroid itself, the microcrystalline material around the spheroid and finally the material below the microcrystals.

Fig. 1B is an electron micrograph of another well-formed spheroid, 4.7  $\mu\text{m}$ , adjacent to an apparently partially formed spheroid. An outstanding example of these spheroids is shown in Fig. 1C where a cluster of  $\sim$  a dozen spheroids is visible. They range from  $\sim 4$  to 10  $\mu\text{m}$ , some well-formed and others only partially formed.

Another interesting morphology, previously observed only in CI chondrites is the plaquette seen in the Essebi CM chondrite as shown in Fig. 1D.

Other forms commonly seen in the CI chondrites and observed in this work in the Essebi and Haripura CM chondrites will also be shown.

- (1) Nagy, B. (1975) Carbonaceous Chondrites, Elsevier.
- (2) Jedwab, J. (1968) Origins and Distributions of the Elements, Pergamon Press.
- (3) Ramdohr, P. (1973) The Opaque Minerals in Stony Meteorites, Elsevier.

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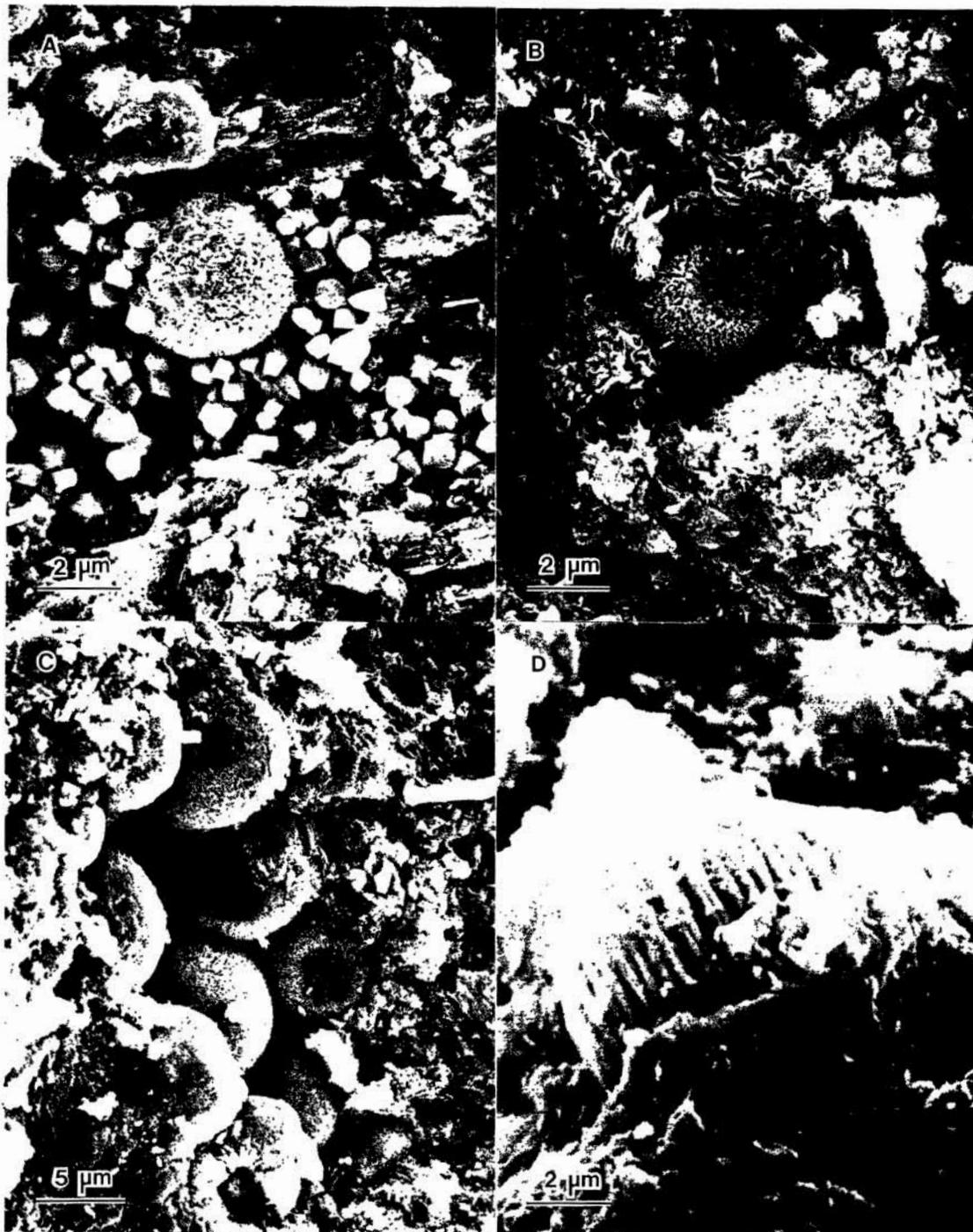


Figure 1A. Electron micrograph of a single grainy magnetite spheroid surrounded by smaller malformed isometric crystals in the Haripura CM chondrite. Figure 1B. Electron micrograph of a well-formed grainy magnetite spheroid with a partially formed spheroid nearby. Figure 1C. Electron micrograph of a cluster of about a dozen magnetite spheroids, some well-formed and some only partially formed, occurring in the Haripura CM chondrite. Figure 1D. Electron micrograph of a magnetite plaquette in the Essebi CM chondrite.