Diverse and Unusual O-chondrites from the Lut Desert, Iran

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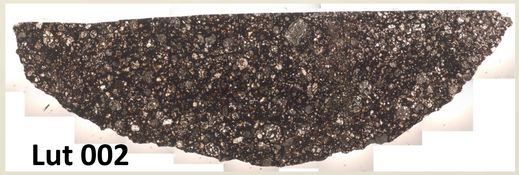
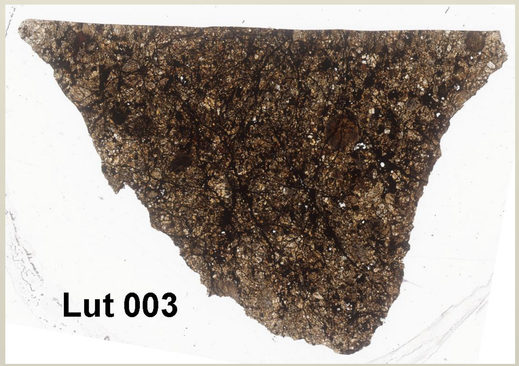
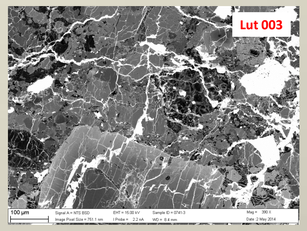
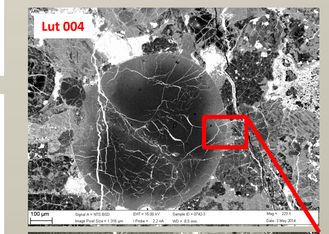
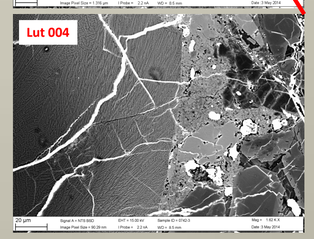
- Two expeditions: February 8 and March 21, 2013
- Four finders: Maziar Nazari, Kiyan Babazadeh, Ashkan Hedayati, Mohsen Adib
- Four finds: three single stones with masses 504.5 g (Lut 003), 504.6 g (Lut 004), 568 g (Lut 002), and 92 fragments totaling 2.1 kg (three of them are Lut 005, Lut 006, and Lut 007)



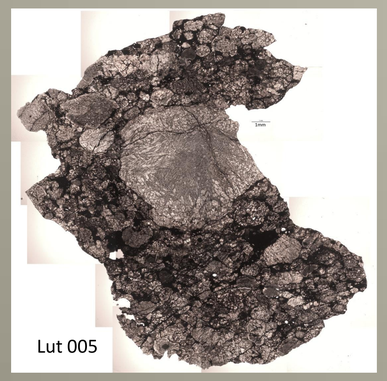






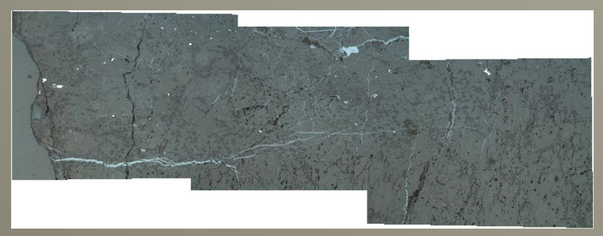


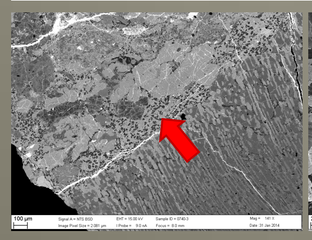
Transmitted light mosaic of Lut 002 (straight edge is 3.3 cm long). BSE image shows that silicates are equilibrated. Secondary calcium-sulfate (red oval) is a product of terrestrial weathering.
Scans of Lut 003 and Lut 004 thin sections (straight edges are 2.0 and 1.9 cm respectively). ***Both are highly unequilibrated.*** Lut 004 contains patches of fine-grained matrix typical of a type 3 ordinary chondrite [e.g., 1]. ***Lut 003 lacks normal matrix, instead consists of smaller chondrule & mineral fragments.***

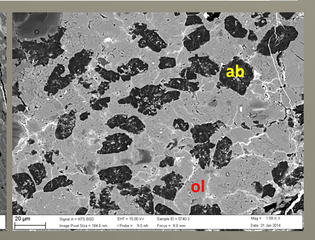


Left: Mosaics in transmitted light of the thin sections of Lut 005, Lut 006, and Lut 007.

- sharply defined chondrules
- somewhat oblate chondrules
- rough alignment of chondrules
- ***atypical matrix (olivine+albite)***

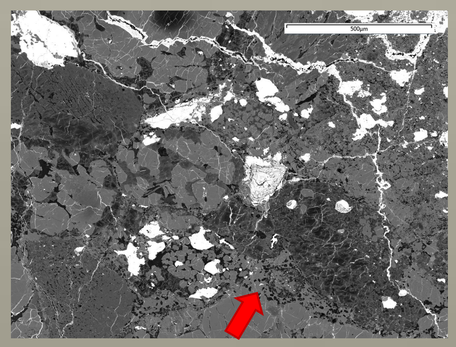


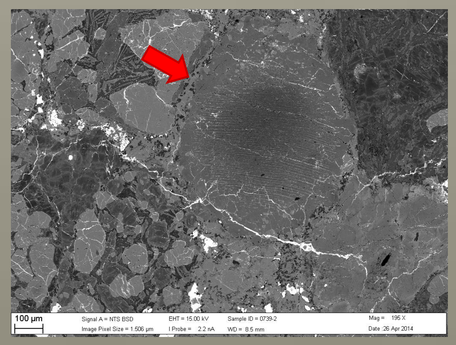




←Transmitted (top) and reflected (middle) light and BSE images of the dark matrix in Lut 005, which consists wholly of 10-20 µm long subhedral grains of albite (ab = Ab_{93-95}) intergrown with relatively iron-rich olivine (ol = Fa_{30-33}) and rare low-Ca pyroxene grains.

The same matrix is → observed in BSE images of Lut 006 (top) and Lut 007 (bottom).





Classification of 6 chondrites (representing three meteorites) from Iran

1. **Lut 002 H4**
2. **Lut 003 L3 (fragmental matrix)**
3. **Lut 004 H3 (relatively low type)**
4. **Lut 005 LL3 (unusual matrix, olivine+albite)**
5. **Lut 006 LL3 (paired with Lut 005)**
6. **Lut 007 LL3 (paired with Lut 005)**

New dense collection area (DCA) in Iran has yielded five official chondrites (Shahdad – H5 [2], Lut 001 – H5 [2], and Lut 002 through Lut 007), suggesting that this area will be highly productive of new meteorites.

References: [1] Huss G.R. et al. 1981 Geochimica et Cosmochimica Acta 45:33-51; [2] Meteoritical Bulletin Database

Below: Picking up some of the 92 pieces of the 2.1 kg LL3 chondrite (Lut 005, 006, and 007).