A CRUCIFORM CHROMITE IN AN AGGLUTINATE IN LUNAR SOIL 15271:
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This is a report on the occurrence of a very small cruciform alumino-titano-chromite in a presumably mare basalt mesostasis fragment in an agglutinate in lunar soil 15271.

The clast of mesostasis consists mostly of very small crystals of pyroxene (~70%), plagioclase (~20%), and Si-K rich glass (~10%). The crystals of pyroxene and plagioclase are elongated, usually less than 5 μm in length and 1 μm or less in width. However, they do not occur as skeletal crystals. Because of the abundance of pyroxene in the mesostasis we assume that the clast is from a mare basalt, although no ilmenite is present. Also absent are any discrete crystals of phosphates, K-felspars, and silica minerals, which suggest that the mesostasis is probably not from a KREEP basalt.

The cruciform chromite measures approximately 6 μm x 6 μm diagonally. However, the crystal is skeletal and also very thin. The arms of the cross have grown along {100} and have been filled in with overgrowth along {111}. The crystal is so thin that even a 0.1 μm sized election beam at low energy (7 Kv) excites a part of the material beneath and surrounding the chromite crystal. Therefore, it is not possible to obtain a quantitative chemical analysis of the chromite, let alone a good energy dispersive X-ray spectrum.

DISCUSSION. Cruciform titanomagnetite spinels are known from the earth (1). These titanomagnetites are much larger usually of the order of 100 μm, and do not ostensibly contain any significant amount of chromium. These titanomagnetites are, however, products of very rapid cooling from a melt and usually occur in terrestrial lava flows. Chromites are not rare in lunar rocks and especially in mare basalts (2-4). However, in none of the occurrences reported can one find any desciption or stability relations of cruciform or skeletal crystals. Chromites reported from meteorites also do not appear to take on the form reported here (cf. 5,6). To the best of our knowledge, this is the first report of a cruciform chromite from the moon, if not from anywhere.

Small euhedral crystals of chromite are also reported to have formed by direct condensation from a vapor phase in the vugs of some moon rocks (7,8). These crystals are fully grown and despite rapid cooling (?) are not skeletal in morphology.

Given that this chromite crystal is found only in one rare small clast of mare basalt mesostasis, it is difficult to infer much about the crystallization of the basalt itself. We can only tentatively conclude that the presence of chromite in the pyroxene-rich mesostasis suggests that the combination of f_{O_2} and a Cr in the late stage melt was such that Cr did not enter into the structure of pyroxene, but crystallized as an oxide instead.

REFERENCES. (1) Haggerty,S.E., 1976, in MSA Short Course 3, Hg-101-Hg-300; (2) Dalton,J. et al., 1974, LS V, 160-162; (3) El Goresy, A., 1976a, in MSA Short Course 3, EG-1-EG-46; (4) Coish,R.A. and Taylor,L.A., 1978, Mare Crisium, 403-418; (5) Ramdohr,P., 1973, The Opaque Minerals in Stony Meteorites, Elsevier, 245 p.; (6) El Goresy,A., 1976b, in MSA Short Course 3, EG-47-EG-72; (7) Jedwab,J., 1971, PLSConf. 2, 923-936; (8) Carter,J.L. et al., 1975, PLS Conf 6, 719-728.

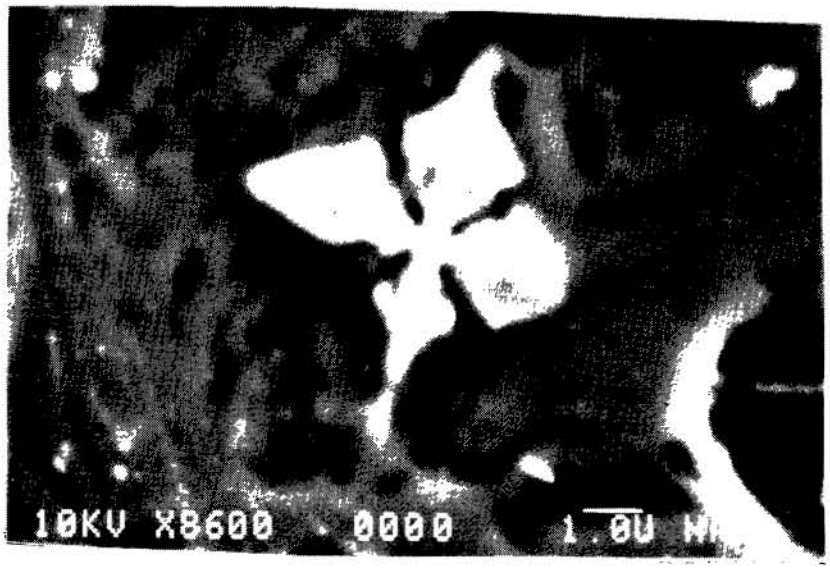

Fig. 1. Scanning electron photomicrograph of the cruciform chromite; notice scale and skeletal morphology.

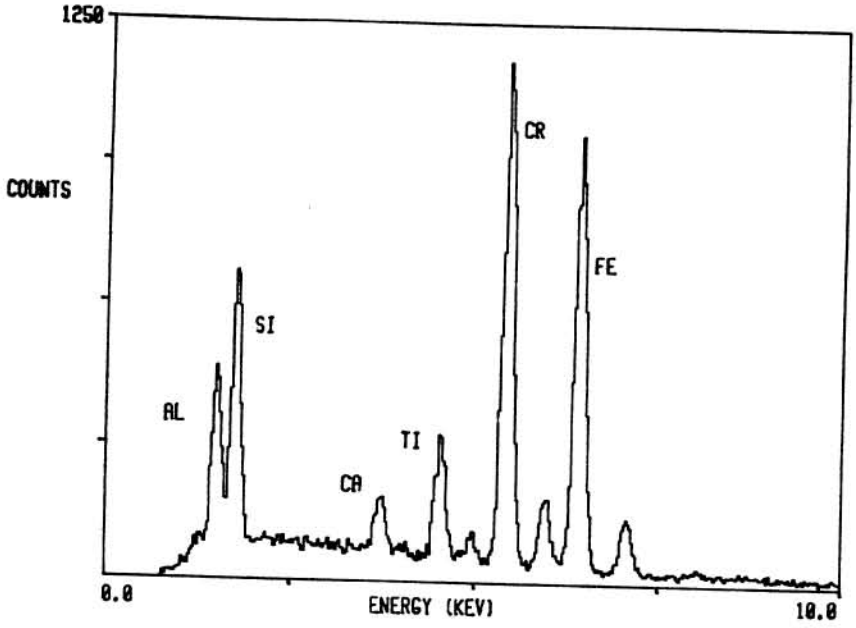

Fig. 2. A contaminated energy dispersive X-ray spectrum of the chromite and associated minerals in the mesostasis. All of Si and Ca, and at least a part of the Al signal are from silicates.