Citation


URL

https://oro.open.ac.uk/8687/

License

None Specified

Policy

This document has been downloaded from Open Research Online, The Open University's repository of research publications. This version is being made available in accordance with Open Research Online policies available from Open Research Online (ORO) Policies

Versions

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding
HAMBLETON - A NEW SULPHUR RICH PALLASITE
D.Johnson¹, R.Hutchison², C Kirk² and M.M.Grady ¹,². ¹Open University, Walton Hall, Milton Keynes, MK76AA, United Kingdom. E-mail: D.Johnson@open.ac.uk. ²Natural History Museum, London, SW7 5BD, UK.

Introduction: A new pallasite, a single mass of 17.6 kg, was found south of Hambleton, North Yorkshire, by R and I Elliott in August 2005. The mass is composed of ~60 vol % olivine, ~25 vol% metal and ~15 vol% sulphide. The phases are irregularly distributed and highly weathered. There follow the results of a study by optical and analytical scanning electron microscopy.

Observations: Olivine occurs as cm-sized sub-rounded crystals in a granular mosaic. Many contain sub-parallel sets of fractures, some of which are annealed, while others are filled with metal or sulphide. In metal-rich or sulphide-rich areas olivines are fragmented and angular to sub-angular and veined by metal or sulphide respectively. Some regions <5cm in size are composed entirely of olivine crystals enclosed within troilite. Olivine is Fo₈₈.₃, and together with the oxygen isotopic ratios: δ¹⁷O = +1.383‰; δ¹⁸O = +3.029‰; δ¹⁷O = -0.187‰, indicate that the meteorite is a main group pallasite. From the olivine-rich exterior, weathering has penetrated for 4-5 cm towards the interior of the mass. The weathered, olivine-rich outer portion is brittle and prone to disintegration. A blue secondary mineral rich in Mg, P and Fe was shown by XRD to be baricite (Mg, Fe)₃(PO₄)₂.₈H₂O. Much of the metal has succumbed to terrestrial oxidation, especially low-Ni phases such as kamacite, cloudy taenite or plessite. The sulphide is more susceptible to terrestrial alteration than the metal.

Discussion: Metal rich regions are consistent with the view of Scott [1] that pallasites formed by the injection of metallic liquid into dunite. Evolved metallic melts, related to IIIAB irons, should be sulphur-rich. Paucity of sulphide in pallasites led Ulff-Moller et al [2] to suggest that either FeS-rich liquid was lost or formed pallasites that are underrepresented in our samples.

Conclusion: With Phillips County (pallasite), Hambleton is a rare FeS-rich pallasite.

References: