

X-RAY MICROTOMOGRAPHY OF A SULPHIDE RICH PALLASITE.

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Introduction: Main Group pallasites are generally considered to have formed in an asteroidal core-mantle boundary region. It has been suggested that sulphide rich pallasites are under represented in our collections [1,2] only two such pallasites have been identified Phillips County and Hambleton [3]. Because of the dynamic nature of the processes involved in the formation of this type of pallasite, the keys to understanding them may be as much structural as chemical. Here, we discuss the application of X-ray microtomography to the sulphide rich main group pallasite Hambleton as an attempt to further understand pallasite genesis.

Discussion: X-ray microtomography (XMT) and custom computer software were used to visualise the interior of a sample of Hambleton in three-dimensions. This is a non-destructive technique used to examine the internal components of opaque solid samples. XMT was performed on a Phoenix v|tome|x 's' system, this generated a dataset of several hundred two-dimensional section images (tomograms) through the specimen, with a slice thickness of approximately 60 μm . XMT maps the variation of X-ray attenuation within an object (roughly equivalent to density); strongly attenuating metals and sulphides appear as brighter pixels in slice images compared to olivine. Following the methodology of Sutton et al. [4], the two-dimensional tomographic dataset was reconstructed using the custom SPIERS software suite to create a three-dimensional 'virtual meteorite'. Tomograms were manually 'edited' prior to reconstruction to accurately assign pixels to the major phases in the sample. Virtual models were studied on computer using stereo-capable viewing software. The samples were found to be composed of large angular olivine crystals intersected by metal and veins of FeS containing small angular fragments of olivine. The results show the sulphide distribution through the sample as thin veins and irregularly shaped sheets of FeS that are largely interconnected, filling the regions between olivine and metal.

Conclusion: X-ray microtomography is an under utilized technique for the study of diverse samples such as pallasites. The three-dimensional textures observed in Hambleton may be explained by introduction of a large sulphide volume under pressure into a metal-olivine mixture with metal approaching solidus temperature.

References: [1] Ulf-Moller F, 1998, *Meteoritics and Planetary Sciences*, 33, 207-220, [2] Ulf-Moller F, 1998, *Meteoritics and Planetary Science*, 33, 221-227. [3] Johnson D. et al 2006, *Meteoritics and Planetary Science*, 41, A88-9. [4] Sutton M. D. et al. 2001. *Paleontologica Electronica* 4: article 2 (http://palaeo-electronica.org/2001_1/s2/issue1_01.htm).