ESKOLAITE IN AN ANTARCTIC MICROMETEORITE

M. J. Genge[1], H. Smith[1] and R. P. Harvey[2]. [1]Impact and Astromaterials Research Centre, Department of Earth Science and Engineering, Imperial College London, Exhibition Road, London SW7 2AZ, UK. E-mail: m.genge@imperial.ac.uk. [2]Dept. Geological Sciences, Case Western Reserve University, Cleveland, Ohio, USA.

Introduction: Micrometeorites (MMs) are that fraction of the Earth's extraterrestrial dust flux that survives atmospheric entry and is recovered from the Earth's surface [1]. The majority of MMs represent interplanetary dust and are thought to include samples of both asteroids and comets [1]. Previous studies have reported a wide range of mineral assemblages, dominated by olivine, pyroxene, clay minerals, FeNi metal and Fe sulphides, which mirrors that of the chondrites [1]. The number of minor phases reported within micrometeorites, however, is restricted compared to those of meteorites. In this paper we report the first discovery of the unusual mineral eskolaite (Cr_2O_3) within an Antarctic MM.

Results: Particle AH94-005 is a scoriaceous MM (ScMM) collected from the Allan Hills moraine by ANSMET and was characterised as part of a wider study of aeolian MMs. The particle is a typical ScMM dominated by a highly vesicular mesostasis of sub-micron fayalitic olivines with interstitial aluminosilicate glass. Relict, anhedral enstatite crystals, up to 6 microns in size are present and the particle has a well developed magnetite rim. A cluster of small (<5 micron), anhedral eskoliate crystals occur in one area of ALH94-005 and were identified by a repeated EDS analyses and X-ray mapping using an analytical SEM. X-ray mapping suggests minor substitution of Fe for Cr in the outermost rim of eskoliate crystals and a diffusive halo of Cr within the surrounding mesostasis. Wide beam EDS analyses indicate the particle has a bulk composition within the range of other ScMMs.

Discussion: Eskoliate is a rare but widespread mineral within meteorites and has been reported within CM2 [2] and CV3 [3] chondrites, ureilites [4], martian meteorites [5] and in the fusion crusts of iron meteorites [6]. It is thought to form by thermal decomposition of chromite. The high melting temperature of eskoliate of 2618K precludes its formation in AH94-005 by direct crystallisation from the mesostasis and the absence of chromite precludes exsolution during atmospheric entry heating. Instead the occurrence as a cluster of anhedral crystals suggests it is a relict phase that fragmented due to thermal expansion during atmospheric entry and it is, therefore, part of the particle's primary, parent body-derived, mineral assemblage.

Conclusion: Owing to its widespread occurrence in meteorites the presence of eskoliate within MMs cannot be used to establish parent body association. Its presence within a typical ScMM, however, is consistent with the CM2-like nature of many of these particles [1] and suggests that thermal decomposition of chromite by thermal or shock metamorphism was an active process on their parent bodies.

References: [1] Genge M. J. et al. 2008. *MAPS*, 43:497-515. [2] Nazarov M. A. et al. 2009. *Petrology* 17:101-123. [3] Hua X et al. 1988. *GCA*, 52:1389-1408. [4] Chikami J. et al. 1997. *MAPS* 32:343-348. [5] El Goresy A. and Fechtig H. 1967. *Smithson. Contrib. Astrophys.* 11:391-397.