CHONDRITIC MICROMETEORITES FROM THE TRANSANTARCTIC MOUNTAINS

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Introduction: We report the petrographic description of unmelted micrometeorites in the 400-1100 µm size range from the Transantarctic Mountains [1]. These "giant" micrometeorites represent a new extraterrestrial material for planetary science that requires investigation. Eight particles recovered from Frontier Mountain and Miller Butte (Victoria Land) during the Italian 2003 and 2006 PNRA expeditions were selected for this study. Morphological and structural data were obtained by means of microanalytical SEM; textural and mineralogical data were obtained by FEG-SEM and EPM analyses on sectioned samples.

Petrography: Particles are fresh complete individuals. Their size ranges from 400 µm to 1100 µm. Particles 5.31, 20c.343, 4.14 and 21c have irregular shapes and magnetite rims. Particles 5.11, 19.11, 5.22 and 21i are subrounded and show vesicular fusion crusts. Particles 5.31 and 5.11 show readily delineated type II POP chondrules set in a recrystallized matrix. They mainly consist of olivine and low-Ca pyroxene with lesser amounts of oligoclase, Fe,Ni-metal and troilite and accessory chromite. Particles 20c.343 and 19.11 show higher recrystallization. Olivine and low-Ca pyroxene composition of particles 5.31, 5.11, 20c.343 and 19.11 ranges from $Fa_{17.5}$-$Fa_{30.2}$ to $Fs_{16.6}$-$Fs_{25.9}$. The Cr/(Cr+Al) and Fe/(Fe+Mg) in chromite range from 0.86 to 0.89 and 0.84 to 0.88, respectively. This data suggests that these four particles consist of equilibrated ordinary chondritic material. Particle 5.22 and 21i consist of type I POP chondrules. Their olivine and low-Ca pyroxene composition are $Fa_{12.6}$ $Fs_{10.3}$ and $Fa_{1.2}$ $Fs_{0.9}$, respectively. Accessory minerals include Fe,Ni-metal and troilite. This data suggests an affinity with carbonaceous chondritic or type 3 ordinary chondritic material [2]. Particle 4.14 consists of type I POP chondrules set in a fine-grained matrix. Olivine composition is $Fa_{2.1}$, low-Ca pyroxene composition $Fs_{3.8}$. Accessory minerals include Fe-oxides, Fe,Ni-metal (~1 vol.%) and a Fe,Ni-sulfide. The texture and mineralogy are similar to those of CV chondrites. Particle 21c consists of compact fine-grained silicate mineral assemblages with accessory magnetite framboids and plaquettes, and sulphides, similar to CI carbonaceous chondrites.

Conclusion: This study shows that unmelted micrometeorites deriving from chondritic material are frequent in the 400 µm to 1100 µm size range and further confirms that a large part of the micrometeorite flux in this size fraction is of asteroidal origin, including a significant number of ordinary chondrites, as demonstrated by oxygen isotopes of cosmic spherules [3].

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