

CURATION AND ALLOCATION OF THE NEW ANTARCTIC NAKHLITE, MIL03346.

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Introduction: In January 2004, the ANSMET reconnaissance field team (Fig. 1) working in the Miller Range of the Transantarctic Mountains discovered a 715 g achondrite that was instantly recognized as unique. Named MIL03346, initial processing (NASA Johnson Space Center or JSC) and classification (Smithsonian Institution or SI) revealed this achondrite to be a nakhlite (Fig. 2). MIL03346 is the seventh nakhlite recognized in world collections [2], the third nakhlite returned from Antarctica, and the first nakhlite in the US Antarctic collection (Table 1). The following is a summary of the steps taken in the processing and allocating of MIL 03346 and some comparisons to some other lunar and martian meteorites processed and allocated at JSC.

Sample requests: Following a special edition of the Antarctic Meteorite Newsletter [1], we received 50 requests for material from scientists from 8 countries. These requests represented a broad range of martian science. The total number of requests for the fall meeting was 105 and signified an all-time record for requests in the 28 year old ANSMET-NASA-SI program. The Meteorite Working Group (MWG) met in September 2004 and made an assessment of requests for the nakhlite. MWG proposed that 47 requests be honored which included preparation and allocation of 90 individual sample splits. Upon approval of the recommendations of the MWG by the Meteorite Steering Group, the nakhlite was prepared for processing.

Table 1: summary of known nakhlites.

meteorite	Year found	Mass (g)
Nakhla	1911	10,000
Lafayette	1931	800
Governador Valadares	1958	160
Y593,749,802	2000	15,022
NWA817	2000	104
NWA998	2001	456
MIL03346	2003	715

Slabbing and processing of MIL 03346: Due to the large number of individual samples requested, slabbing was considered the best way to preserve as much of the original mass as possible for future study and also to document the individual meteorite chips allocated. A 1 cm thick slab was made of MIL03346 (Fig. 3) and all of chips and potted butts for thin sections were obtained from the slab. Many scientists requested thin sections that were made without water in any stage of

the process. In addition, many of the requests involved studies of organic geochemistry. In order to minimize or eliminate contamination, MIL03346 was processed in a glove cabinet dedicated specifically to martian meteorites, which was cleaned with ultra pure water and thoroughly dried immediately before processing. From the initial processing stage, the entire sample has been packaged and stored in Teflon and stainless steel. Also, the multitude of analytical techniques used today requires the use of many different kinds of sections – we prepared close to 30 standard thin sections, five 150-200 µm thick sections for laser ablation analysis, several thicker sections for ion probe, or other micro-sampling techniques, and several sections with superglue allowing detachment for study with specific techniques (ion probe, transmission electron microscopy). Finally, several investigators requested spatially documented samples that are critical to the scientific problems being addressed. All samples were supported with photodocumentation during preparation and processing of those splits.

Comparison to previous lunar and martian meteorite processing: The US Antarctic Meteorite program has obtained large lunar and martian meteorites in the past for curation and processing (Table 2). It is of interest to compare some of these past experiences with the current MIL nakhlite to highlight not only the degree of maturity the program has attained, but also the diversity of investigators that is interested in studying martian meteorites. Disciplines supported include martian magmatism, organic geochemistry, rock magnetism, aqueous alteration, weathering mineralogy, radiometric age dating, fluid and melt inclusion studies, terrestrial and space exposure histories, volatile element (N, C, S), and noble gas isotopic studies.

Table 2: Large lunar [3] and martian meteorites processed at NASA-JSC (statistics are from first meeting after announcement or reclassification).

meteorite	Year	mass	# PI	# splits
MAC88104/5	1989	662/61	19	99
ALH84001	1997	1100?	44	130
MIL03346	2004	715	50	90

References: [1] Antarctic Meteorite Newsletter, vol. 27, no. 2 (July 2004); [2] Meyer, C. (2004) Mars Meteorite Compendium, (<http://curator.jsc.nasa.gov/curator/antmet/mmc/mmc.htm>); [3] Lindstrom, M.M. et al. (1991) GCA 55, 2999-3007.