A Cryogenic Inert Atmosphere Sample Curation Facility

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The Tagish Lake meteorite fell January 18 2000 onto a frozen lake surface northern British Columbia, Canada. Samples of the meteorite were recovered within a week of the fall and kept frozen and untouched by hand. As the meteorite is a unique and especially carbon-rich carbonaceous chondrite [1], the circumstances of its fall and recovery represent a unique opportunity to gain insights into the origin and evolution of organic matter in the early Solar System.

The pristine nature of Tagish Lake requires a special facility in which the meteorite may be processed while minimizing oxidation and/or loss of volatile organic components. We have established a facility that consists of a state-of-the art Ar gas glove box, housed within a -20 °C controlled environment chamber. The Ar gas is purified with an MB 20 G gas purifier (MBraun, Inc.) and continually recirculated. A Class 1000 clean room serves as a room temperature anteroom and source of clean air for the chamber. Samples may be studied or processed in either an inert atmosphere (in the glove box) or in cold air (in the chamber), depending on the nature of the sampling required.

Establishing baseline contaminant levels

We have carried out a suite of tests in order to establish the baseline levels of compounds of interest, before the facility is used to process Tagish Lake specimens. Some significant findings include the diminishing of volatile compounds (e.g., styrene and aniline) in the glovebox atmosphere under normal operating conditions (-15 to -20 °C) relative to room temperature, and poor elasticity of Hypalon™ gloves under standard operating conditions [2]. However, the facility has now been successfully used to sample previously unstudied Tagish Lake specimens.

The cryogenic facility at the University of Alberta is unique. Beyond enabling more detailed study of the Tagish Lake meteorite, the facility provides insights into the use of cryogenic methods in the curation and handling of pristine planetary samples.

[1] Grady M.M. *et al* (2002) *M&PS*, **37**, 713-735. [2] Hilts R.W. et al. (2013) *M&PS*, **48 (Suppl.),** Abstract #5317.