NSCG Newsletter

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Species Prone to Thermal Shock and Cracking

Native sulphur is so heat sensitive (has a high co-efficient of thermal expansion) that it will suffer spalling if held tightly in the hand, this occurs as the outer part of the crystal expands much more rapidly than the inside. Native sulphur is a fairly common mineral, found in most collections.

Many crystalline minerals contain small cavities partly or wholly filled with liquid, these are called fluid inclusions. In an environment with rapidly changing temperature, for example, turning on display case lights or moving specimens from an unheated store to a warm room, the fluid in these inclusions may expand or contract more severely than the surround mineral, leading to fracturing or even explosive disintegration. Fluorite specimens are particularly prone to fracture damage from fluid inclusions.

Collection workers should be wary of potentially large temperature variations inside showcases used for minerals, traditionally lit very brightly, or where sunlight adds to the thermal gain. Mineral specimens should also be well packed for transportation and allowed time to acclimatise in a new environment before unpacking.

References:

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Frozen Collections and Incorrect Temperature

Increasingly, natural history collections contain frozen material, dead animals and birds awaiting mounting or skin preparation have long been stored in museums, but collections of frozen tissue intended for DNA sampling are becoming more common. Freezer alarms, back-up freezers or alternative power supplies should be in place where maintenance of collections below 0°C is essential. Elderly freezers should be checked regularly, a procedure that prevented a disaster from occurring at Ludlow Museum recently, we have kept the old freezer as a back up to the new one.

Specialist geological institutions may also house frozen material, for example ice cores from glaciers and polar ice sheets and frozen deep-sea soft sediment cores. Specialist low temperature tabs and cold weather clothing for staff are needed to work on these specimens.

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Conservation of Two Frozen Specimens, CMN 56973 and CMN 56974

The Canadian Museum of Nature mineral collection houses two very unusual specimens of native silver collected from a mine in the permafrost of northern Canada. The dendritic silver has grown in a vein of ice within the rock matrix.

Five specimens were originally collected in late 1980s, but despite being flown back to Ottawa in cooler boxes, only two survived the journey. These specimens were bagged and placed in the Mineral Sciences department chest freezer inside a cooler box.

Concern was expressed that over time, condensation would accumulate as frost on the specimens and could slowly become compacted and incorporated into the ice of the original specimens. Analysis of the ice would therefore be contaminated by modern water with the potential of invalidating results.

A decision was taken to clean the specimens and re-pack in such a way as to prevent ice formation and also to provide some buffering against melting in the event of a freezer failure or other temperature increase.

In the absence of a low temperature laboratory, conservation work was undertaken outside in a shaded carport during the Canadian winter. The exterior temperature was around -5°C.

The specimens were taken outside in the cooler box for conservation. Wearing disposable gloves, the specimens were unwrapped. The surface was found to be covered with a substantial amount of loose frost. This was gently removed by brushing and levering with dental tools, revealing an irregular vein of dense smooth ice in a grey and rust coloured rock matrix. Very beautiful completely untarnished silver was found growing in and out of the ice; the form of the silver was rather like a series of lobes of a liverwort. The ice had clearly melted a little since the specimens were collected as the silver protruded from the surface of the ice. Once cleaning was complete specimens were quickly transferred back to the cooler box and then into the freezer.

5mm thick crosslinked polyethylene closed cell Volara 2A foam was used to protect areas of the ice with protruding silver by cutting a hole in one layer of foam and placing a second layer on top. The specimens were then tightly wrapped in thin polythene, of the thickness used to make dry-cleaning garment covers.

A long 10cm wide strip of Volara foam was cut and used to bandage the specimens, this was intended to provide additional insulation and some buffering from temperature increases. Finally, a bag was constructed for each specimen from Marvelseal, an oxygen impermeable film used commercially for vacuum packed food. Marvelseal consists of three layers, an aluminium foil bonded to a polyester with a polyethylene layer to permit heat sealing.

Once the size of the specimens had been established, the bag was made in the lab by cutting and folding the film and then heat sealing both sides. Double seams were used to guard against failure. Working inside the freezer, the specimen was then placed inside the bag along with a specimen number and the third side heat sealed with a hand operated heat sealing device, leaving a small hole for the vacuum pump tube. As much air as possible was then evacuated from the bag with the vacuum pump, causing the bag to collapse onto the padded specimen, the gap was then also heat sealed with a double seam. Finally, the specimens were replaced in the cooler box inside the freezer. The position of the protruding silver was marked on the outside of the bag in indelible black ink to prevent future crushing.

Although this form of storage means that specimens cannot be viewed without cutting open the bag, these measures have now protected the specimens for almost eight years. An entire slide film was used to document the procedure and close up photographs were taken of both specimens. At the time that work was undertaken, oxygen impermeable clear film was not easily available, had clear film been used, the specimen would still not be visible because of the polythene wrapping and Volara padding.

Kate Andrew and Rob Waller undertook cleaning and re-packing of these specimens in 1991.

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