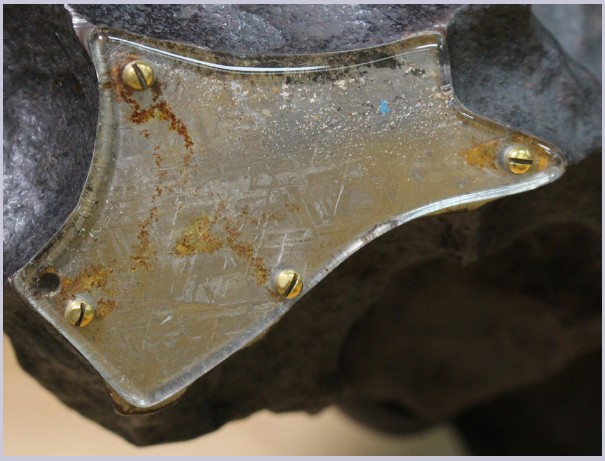
SOMETHING ABOUT METEORITES:
WHEN CORROSION PREVENTION CAUSES CORROSION



The Specimen

The Gibeon meteorite specimen NHMUK BM.1930,422 at the Natural History Museum in London is a 136 kg IVA iron fine octahedrite find from Great Nama Land, Namibia (Africa) with a polished face showing Widmanstätten/Thomson pattern. The specimen had been on loan for 3 years on open display exposed to environmental change and frequently touched by visitors. The fusion crust is stable but the real area of concern was the polished section at the top of the specimen. This was significantly marred by corrosion underneath its Polymethyl methacrylate (Perspex) cover *(left)*.

The Issue

The Perspex cover had been attached to the polished section to prevent contamination from visitor's hands because chlorides from sweat residues will accelerate iron corrosion. However, iron oxides have formed below the cover. This is likely due to condensation of atmospheric water below the cover plus establishment of electrochemical cells due to the presence of the screws. Re-polishing the surface was considered unsuitable in this instance so several chelating gels were trialled to remove the corrosion products. The chelators were added to gels made from Laponite RD or Methyl cellulose to ensure the localised control of chemical reactions and reduce evapouration rates:

1) DTPA (diethylenetriaminepentaacetic acid) and Tiron (disodium 4,5-dihydroxy-1,3-benzenedisulfonate) buffered aqueous solution (Cotte 2007).

2) EDTA (ethylenediaminetetraacetic acid) and sodium dithionite buffered aqueous solution (Burgess 1991).

3) Sodium dithionite, sodium citrate and sodium bicarbonate aqueous solution (Blum 1989).

The corrosion products turned black after reaction with DTPA and Tiron, which was extremely satisfying...

The polished section following treatment.

Treatment

The most effective treatment proved to be DTPA and Tiron in a Methyl cellulose gel, applied for 30 minutes then cleared with swabs and pure water.

Unfortunately, even though all of the oxidation products were removed, the pitting caused by the initial corrosion had marred the appearance of the surface. The surface was therefore re-etched using a cotton swab dipped in nitric acid.

Finally the screw-holes were filled with Laropal A81 and glass microballoons tinted with acrylic paints and the entire polished section was coated with Laropal A81 (20% in 1:4 isopropanol:white spirit) to protect it from future corrosion (Digney-Peer et al. 2012).

by LU ALLINGTON-JONES

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Burgess 1991 Burgess, H. 1991. The use of chelating agents in conservation treatments. Journal of Paper Conservation 15: 36-44.

Cotte, S. 2007. An evaluation of the role of semi-transparent relining in the conservation of Thangka Paintings. Studies in Conservation 52(1): 2-12.

Digney-Peer, S., Thomas, K., Perry, R., Townsend, J.H. and Gritt, S. 2012. 'The imitative retouching of easel paintings', in J.H. Stoner and R. Rushfield (eds), Conservation of Easel Paintings. Oxford: Routledge, 607-634.

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