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Identification of the resin used for embedding moon stones

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Objectgegevens

Instelling	Rijksmuseum Boerhaave
Kunstenaar / Vervaardiger	nvt
Titel	Maanstenen Apollo 11 missie
Datering	1996
Plek van vervaardiging	USA
Locatie	Museum Boerhaave
Objecttype / Materialen	Moonstones, resin, plastics, wood

Introduction

Rijksmuseum Boerhaave has a very special object in their collection (see figure 1). The object was a gift from President Nixon of the United States to Queen Juliana, Queen of the Netherlands at the time. Queen Juliana donated the object to the Museum Boerhaave.
The object contains a Dutch flag that flew to the moon and back on the Apollo 11 mission in 1969. Along with the flag there are fragments of the moon's surface, moon stones.
The moon stones are embedded in a resin. The resin – moon stones combination is attached to a transparent plate.
The University of Manchester will perform a XCT scan of the moon stones, in order to compare the composition of the stones to the stone which is in the collection of NASA.
To be able to perform the XCT analyses it is necessary to know the composition of the resin in which the stones are embedded.

Figure 1: The embedded Moonstones

Raman spectrometry analyses

To identify the resin used for embedding the moon stones, the resin has been analyzed using Raman Spectrometry. Using the Bruker Bravo, a portable instrument, it was possible to perform Raman analyses without taking a sample. (see figure 2)
The Raman scattering of the resin has been measured in two different spots, both Raman spectra show the Raman scattering of unsaturated polyester (UP) (see figure 3).
The Raman spectrum of the transparent plate shows the Raman scattering of polymethylmethacrylate (PMMA) (see figure 4).

Figure 2: Raman analyses

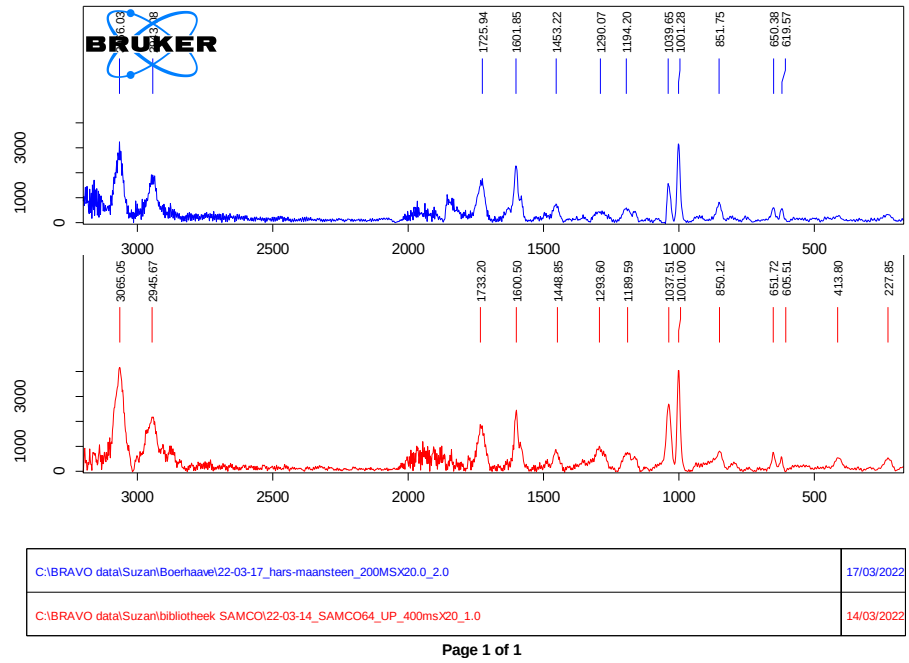

Figure 3: *blue spectrum: resin moon stones*
red spectrum: reference unsaturated polyester (UP)

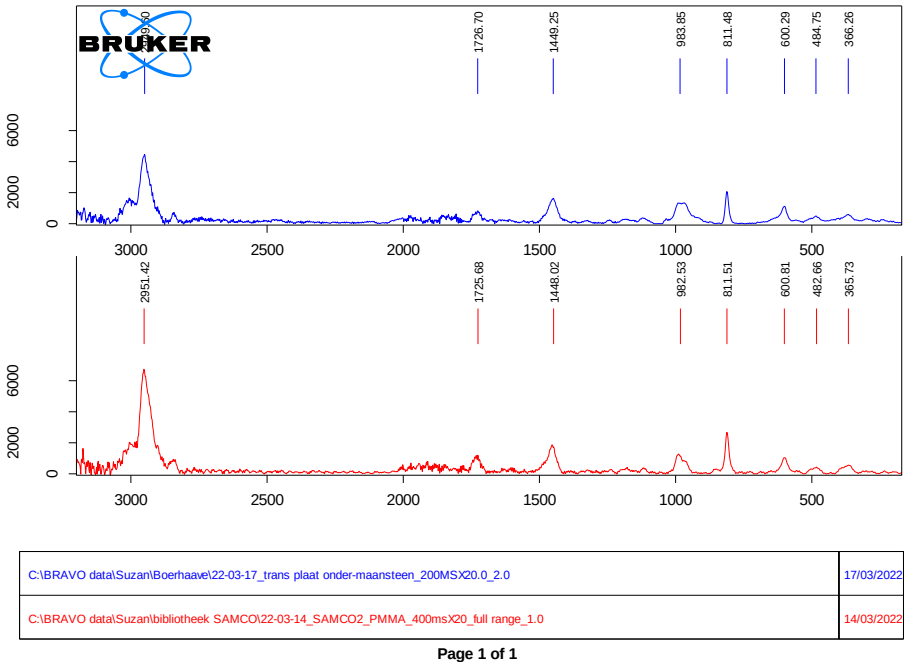

Figure 4: *blue spectrum: transparent plate*
red spectrum: reference polymethylmethacrylate (PMMA)

Conclusion

The moon stones, brought back to earth after the Apollo 11 mission in 1969, are embedded in a unsaturated polyester (UP) resin.
The resin – moon stones combination is attached to a polymethylmethacrylate (PMMA) plate.

Literature

Unsaturated polyester: https://plastic-en.tool.cultureelerfgoed.nl/plastics/detail/UP
Polymethylmethacrylate: https://plastic-en.tool.cultureelerfgoed.nl/plastics/detail/PMMA