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From the bottom of the sea to the display case: A study into the long-term preservation of archaeological maritime silk textiles in controlled atmosphere

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Abstract:

An exceptional group of silk fragments was unearthed in 2014 from a shipwreck, which sank in the mid-17th century, in the Wadden Sea, The Netherlands. A unique example of 17th-century fashion, it comprises about 300 textile fragments from garments, parts of garments and furnishing fabrics, almost entirely made of silk and embroidered or woven with metal thread. These are in remarkably good condition, which may be related to the archaeological environment, the quality of the silk yarns in the fragments, and the presence of metal threads and other metallic objects from the shipwreck. Surviving archeological maritime silk textiles are extremely rare, which makes this a distinctive find posing challenges for selecting the most suitable conditions for exhibition and storage.
Scientific research was carried out with the aim to evaluate the response of modern and archaeological silks to temperature, relative humidity, light and oxygen, in order to define the most suitable parameters for the long-term storage and exhibition of the collection. Artificially aged samples taken from one of the archaeological fragments were analysed at the visual, structural and molecular level by means of colour measurements, Fourier transform infrared spectroscopy (FTIR) and ultra-high performance liquid chromatography coupled to a fluorescence detector (UHPLC-FLD). The results showed that light exposure, in combination with high temperatures, oxygen and moisture strongly affected the silk's structure and molecular composition. Limiting exposure to light and removing oxygen reduced this effect and increased life expectancy significantly. Therefore, the analytical results obtained were essential to defining a preliminary preservation strategy for the collection: while on display, anoxic conditions slow down degradation of the silk by a factor for 4-5, whereas in a in dark storage, low RH is the most important factor, with anoxic conditions providing additional reduction of decay.

Keywords: Archeological maritime silk, artificial ageing, environmental conditions, colour measurements, FTIR, UHPLC-FL