BASKET FROM THE ANCIENT PORT OF THE ZATON

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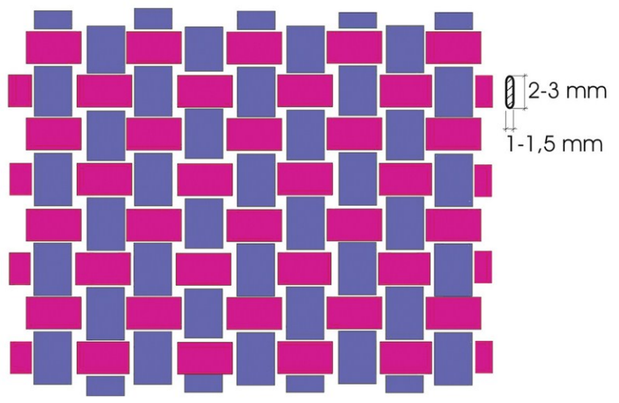
1. Introduction

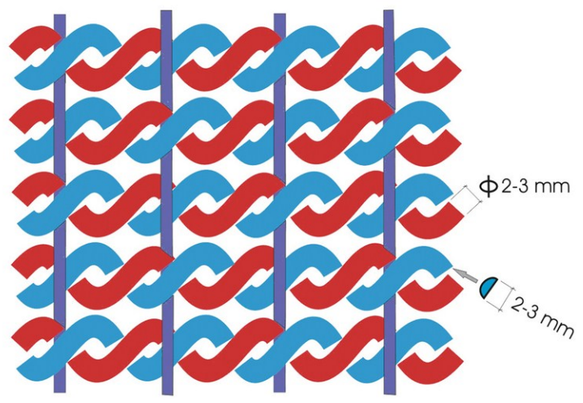
Not far away from Nin a port was discovered with the remains of three Liburnian ships. In addition to various primarily ceramic archaeological findings, archaeobotanical remains were also discovered. Amongst other findings, parts of rope and one of a kind woven basket [Gluščević 2007] are also distinguished. With the purpose of identifying the material (woven basket), spectroscopic analysis (FT-IR) was applied in the process of chemical analysis in addition to thermal and X-Ray analysis. Electronic microscope testing was conducted with the purpose of morphological characterisation.

2. Analysis of sample intermingling

On the basis of the sample 15 mm x 15 mm, 5mm thick and the photographs of the sample, it can be determined that the object consists of two surfaces – face and back. Back of the product is shaped with brushwood, 2-3 mm wide and 1-1.5 mm thick. Our presumption is that the shoots of the Spanish Broom were used for basket weaving. Threads are weaved with 1+1 report forming the plain weave, as presented in scheme 1. The longitudinal and transversal shoots have almost the same shape and width on the entire analysed sample.
The second surface is formed in a similar way where almost half thinner shoots or threads were used. The two pieces of shoots or threads were twisted around each other, forming 2-intermingled plies.



Scheme 1. Plain basket weave – back-side of the product.



Scheme 2. Finer basket weave - face of the product.

3. SEM images and EDX analysis

From the SEM images, it emerges that the found basket sample is composed of fibers and agglomerates that exhibit a sludge-like feature at the macroscopic scale. The inorganic nature of this material is confirmed by the EDX analysis that confirms presence of calcium, aluminum, silicium and magnesium together with oxygen.
Increasing the magnification the deposits and particularly the nod-like junctions become more visible. These are characteristic of both flax and Spanish broom fibers.

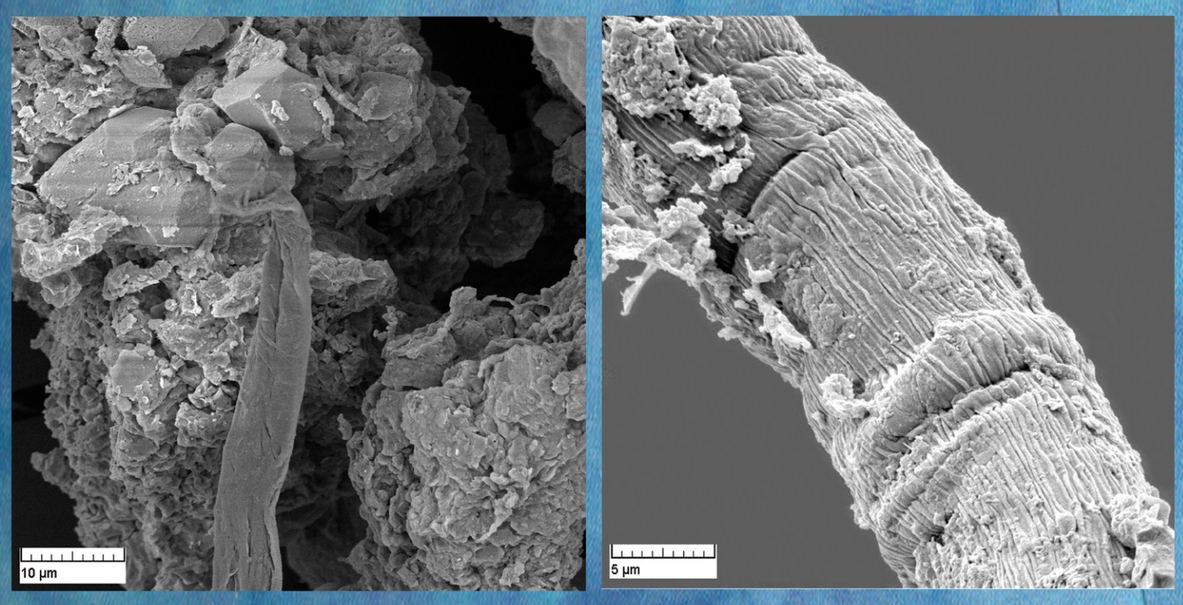


Fig. 1. SEM images of the basket samples: fibers and agglomerates of the related sludge-like material.

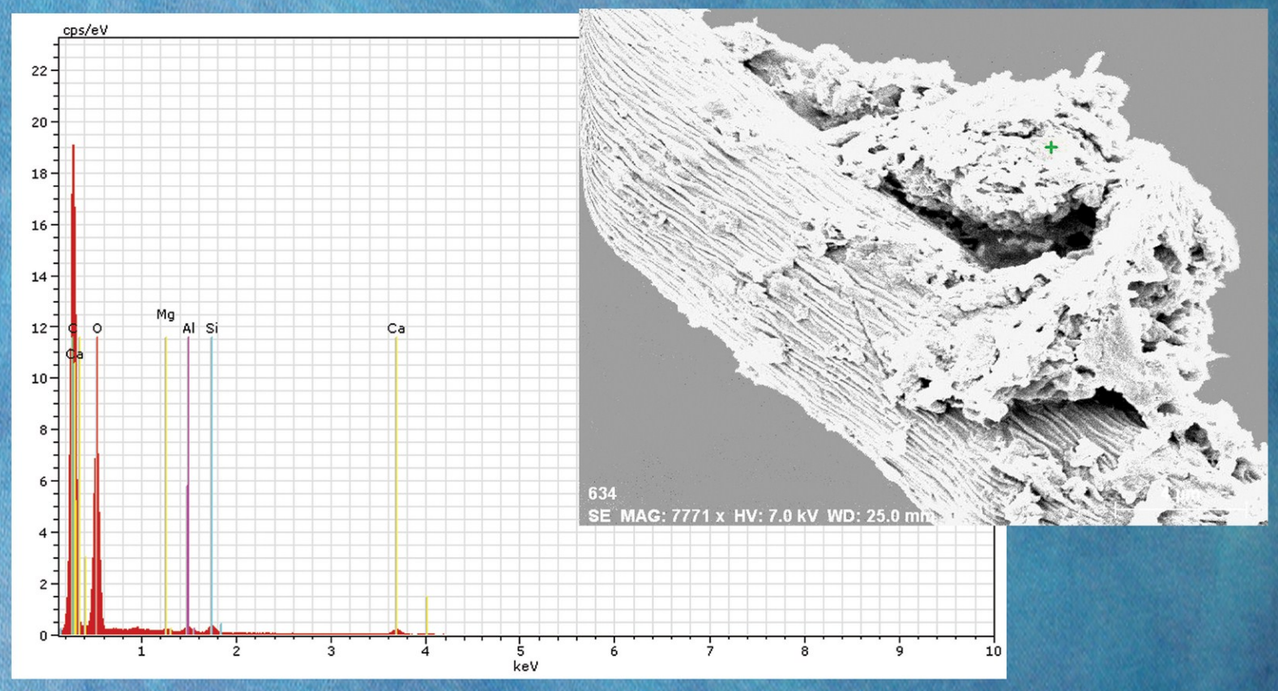


Fig. 2. SEM image of the basket sample and EDX analysis of the agglomerates of the related sludge-like material.

4. Thermogravimetric analysis

The composition of the basket sample can be proposed from a comparison between TGA curves obtained for various samples in air ambient. Bearing in mind the number of step losses and their slopes, the weight loss up to 700 °C can be considered to be due to the organic part of the sample i.e. cellulose. In the case of the basket sample the decomposition of cellulose contained in the sample can be considered as flame retarding due to the presence of inorganic substances. The weight loss at temperatures above 700 °C is attributable to the decomposition of calcium carbonate.

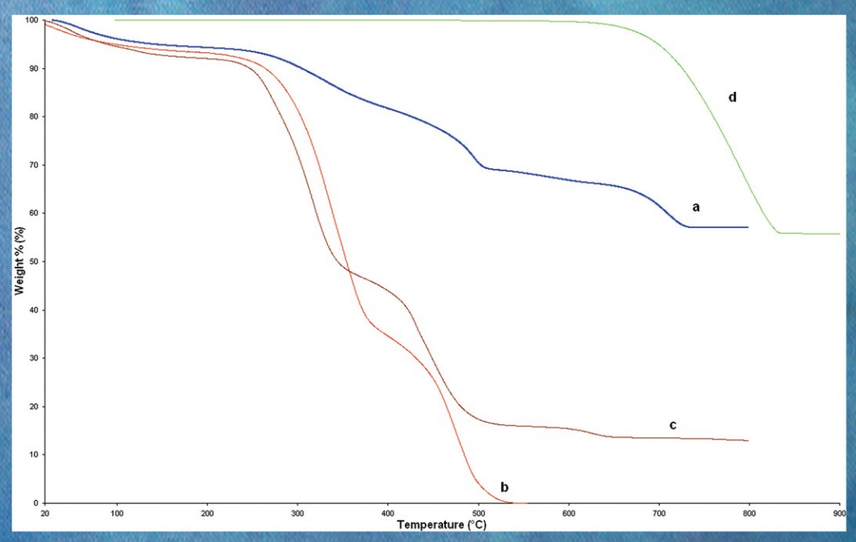


Fig. 3. Thermogravimetric analyses (20 – 800 °C) of a) air- dried basket sample, b) Spanish broom fibers obtained by a mechanical procedure, c) cellulose fibers bearing an inorganic compound d) calcium carbonate.

5. FTIR spectra

The FTIR spectra of the residual matter after the TG analysis confirms the inorganic nature of the agglomerates of the sludge-like material found in the basket sample i.e. the peaks are compatible with mixed magnesium containing alumino-silicate and calcium oxide. As seen from spectra a1 and a2, drying of the samples results only in water evaporation, i.e. the lower intensity of the peaks at ca. 3340 and 1640 cm-1, while the remaining peaks maintain same positions and relative intensity. The presence of waxes is well evidenced from the characteristic peak doublet at ca. 2900-2700 cm-1 (spectra a3). Comparing the latter with the spectra of the Spanish broom fibers obtained by a mechanical procedure it can be seen that the peaks, that vanish after the thermal decomposition and concerning the peak overlap by more intense peaks specific of inorganic compounds, correspond to the cellulosic part of the fiber.

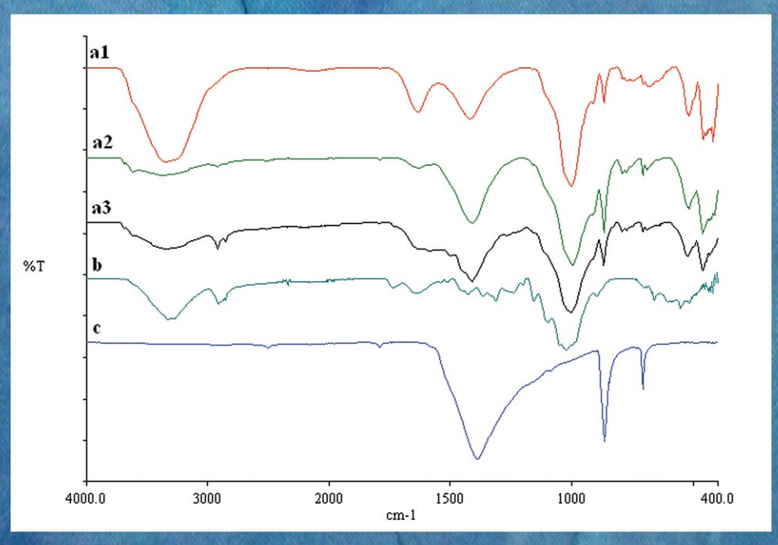


Fig. 4. FTIR spectra (4000 – 400 cm-1) of a1) air- dried basket sample, a2) oven- dried basket sample, a3) sludge- basket sample, b) Spanish broom fibers obtained by a mechanical procedure, c) air- dried basket sample after TG analysis (800 °C).

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