

**DISCOVERY A LINEN SHELLER IN AN ARCHAEOLOGICAL DEPOSIT OF HIGH
IMPERIAL ROMAN (FIRST CENTURY B.C.) IN THE NORTH OF PORTUGAL**

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ABSTRACT

It has been found during excavations in the Povoado of Crestelos, location the banks of Sabor River in northern Portugal, a steel artifact in remarkable state of preservation, which corresponds to a linen sheller. The archaeological stratum in which this artifact has been found is, chronologically, correspond to the first century B.C., in the historical period of the Roman Empire. This affirms the importance of the linen industry was in this historical period and in this region of northern Portugal.

Metallographic examination of valuable information when it comes to the historical interpretation of the finding is derived, as is the existence of a level of fire in the village at that time.

KEYWORDS: micrographs, archeology, linen, SEM, deposits.

INTRODUCTION

Flax fiber has been, since ancient times, the tissue most used by humans. The period of time it takes in use, the fiber, doubles the invention of the wheel. It has been serving mankind since the Neolithic period, at least [1-3]. Not surprisingly, this fiber comes from a plant that bears the Latin scientific name of *Linus usitatissimum* (flax very useful). Besides their use for the manufacture of textiles, linen is considered a miracle food, for its benefits in the prevention and treatment of diseases of the cardiovascular system, digestive, urinary and respiratory. Its main properties are anti-inflammatory and anticancer; The latter relate, more specifically the colon, prostate and breast cancer [1-4].

Flax fibers absorb moisture, up to 20% of its dry weight. Similarly, they released into the atmosphere. This important feature made the intimate feminine clothing was manufactured with linen fabrics; hence the word lingerie. Although linen has a glorious past, it is in the future where the industry should focus. This technology manufacturing linen fabrics have left their testimony in numerous biographical, literary and artistic throughout history appointments (Figures.1 and 2).



Figure.1: Velazquez, "The Spinners".



Figura.2: Goya, "Allegory of the industry."

At the time of the Roman Empire, flax became the main fiber for making fabrics [5-7]. The most prestigious area during Roman times, was the northwest of the Iberian Peninsula, currently, Northern Portugal and Galicia.

In the archaeological excavations carried out in the region of Tras-os-Montes, in northern Portugal, and more specifically, in the archaeological site of Povoado of Crestelos, at the banks of the river Sabor (Figs. 3 and 4), it found a rectangular piece of iron, which had two rows of teeth on opposite sides and was identified as a linen sheller (Figure.5). At present, there are many different shellers linen, but all with similar geometry (Figure.6).



Figure.3: Povoado of Crestelos archaeological excavations.



Figure.4: Detail of the excavated area.



Figure.5: Linen Sheller discovered in archaeological excavations.



Figure.6: Linen sheller of nineteenth century, of the northwest of the Iberian Peninsula.

The study by scanning electron microscopy of steel of the sheller flax shown globulized perlite and the presence of iron carbides with acicular morphology in with Widmanstätten structure, which served to detect a level of fire in the town excavated [8 -14].

EXPERIMENTAL TECHNIQUE

Archaeological excavations in the area of the Town of Crestelos were carried following the Harris matrix [15]. Fundamentally, this is going dating the different layers excavated, considering, as more modern, the upper layer, and the oldest, the lower layer in contact with the geological ground. The stratigraphic sequence excavated proved to be, from ancient to modern: Chalcolithic, Bronze, Iron, Roman and Medieval.

The number of artifacts dedicated to agriculture are numerous. We can say that, apart from subsistence agriculture in Povoado of Crestelos, farming and industry, which produced for foreign trade surplus was the linen.

The discovery of the linen sheller in the archaeological strata of Roman times confirms the commitment to the linen industry, so popular in the Roman Empire.

Regarding the metallographic study conducted with the linen sheller, metallography was performed using a sample drawn from the archaeological piece (artefact). For the metallographic sample preparation, after preparation grinding, polishing and chemistry etching, is plated with gold for 30 seconds with a current of 20 mA, and thickness of 3 nm of gold to not interfere with images obtained.

The SEM used is a microscope thermionic cathode tungsten filament (FEG). The equipment for this research is the model JEOL JSM 6400 provides images and physicochemical data of the sample surface.

RESULTS AND DISCUSSION

The existence of Povoado of Crestelos, as proven during excavations stratigraphy ranging from the Chalcolithic period (3000 BC) to the Middle Ages (1200 AD);

through by the Roman period in which layer of the first century AD, the linen sheller was found.

This is one piece, hot forged, carbon steel with low in this element, from about 0.15% by weight carbon (Figure.7 and 8).

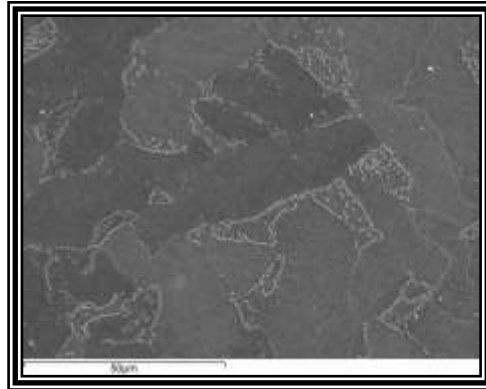


Figure.7: Microstructure of the steel of the linen sheller with a carbon content of 0.15 mass%.

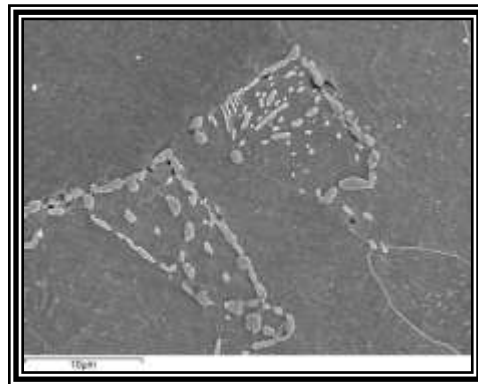


Figure.8: Details of the structure of Figure.7, showing cementite of the pearlite partially globulized.

The metallographic observation shows cementite with globulized forms (Figs. 8 and 9). This means that, at some point in its existence, the town was burned and the linen sheller, suffered, more or less prolonged, a heat treatment with temperatures near the eutectoid temperature(720 ° C), undergoing a process of globulization [16-17].

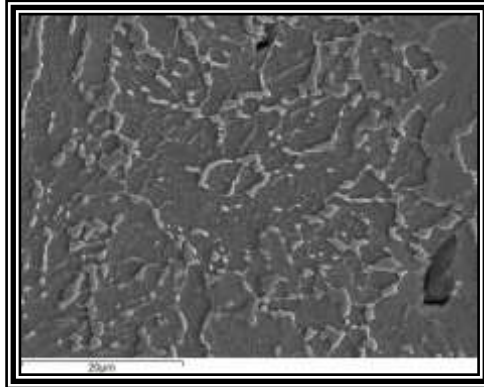


Figure.9: Steel microstructure of the linen sheller showing the globulized perlite by effect of a possible fire.

Another metallographic testimony showing that the linen sheller was subjected to a process of fire, is the presence of fine iron carbides with Widmanstätten structure in ferritic matrix [16] (Figura.10).

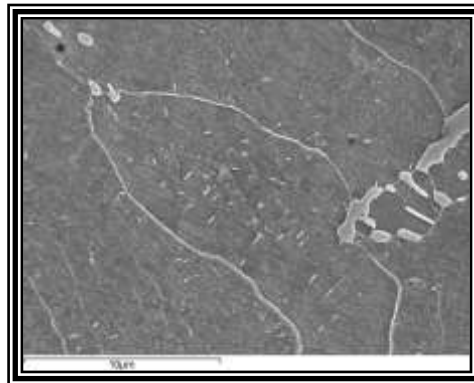


Figure.10: Microstructure where are observed acicular iron carbides with Widmanstätten structure.

All this means that the finding of linen sheller has served to affirm the importance of the linen industry in this geographical area during the existence of the Roman Empire, besides serving as a faithful witness in the history of Crestelos Povoado. The appearance of this piece (artefacts), with signs of having undergone a heat process of globulization has served to indicate the existence of a fire in Roman times in this town.

CONCLUSIONS

The finding of a linen sheller in excavations of Povoado of Crestelos certifies the existence of the cultivation of flax in the northwestern part of the Iberian Peninsula. The fact that his discovery has been in a stratum of the first century, during the existence of the Roman Empire, shows the importance attached to this fiber in this period.

Compared to others linen shellers made of wood, the finding is forged in steel, which made it more durable. Its double comb, narrow and wide step, allowed to have passed increasingly refined.

Another factor that makes it interesting, is the information which has its microstructure. The presence of globulized perlite and acicular iron carbide with Widmanstätten structure, archaeologists used to detect a level of fire in the excavated Roman settlement, and draw historical conclusions that may arise.

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