

# FERROUS ALLOY MINERALIZATION. PYRITE AND OTHER METAL SULFIDES

## Sample

Metal handles of wooden casks. medieval leather industry. Molí de Codina (Tarrega- L'Urgell)

<o:p></o:p>

---

## Pathology Causes

The chemical transformation of donkeys iron product of two factors: the burial environment and contact with the wooden bucket. This mineralization dominated sulphides of iron, can be related to the archaeological site of the burial environment: low in oxygen (Anoxic) with the presence of abundant water, possibly under the underground water table, and in addition to the incidence of bacteria and anaerobic microorganisms, especially the type sulfureductores. The chemical components of the wood also involved in the process.

---

## Visual Image



**Author:** Museu Comarcal de l'Urgell-Tarrega

**Description:** It looks at the remains of a metal ring in an old bucket tanning fully transformed chemically. Surrounded by a concrete calcium carbonate original iron metal ring that was turned into a mass of mineral sulfides, carbonates and iron oxides. Not detected remnants of the original iron alloy.

---

## Image detail / macro



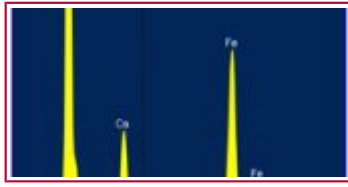
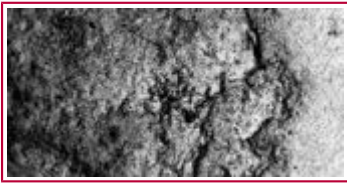
**Author:** Cetec-patrimoni

**Magnification:** 10x

**Description:** Internal structure are observed following layers:

- 1: surface layer of brown tones people, yellow - Golden and black.
  - 2: internal or core layer of gray and microcrystalline texture and compact.
  - 3 Layer yellow - golden. It microcrystalline texture thick microporous.
  - 4: Set of thin laminated layers composed of iron ore and waste wood.
- 

## Microscope Image



**Author:** 1.- CETEC-p 2.- CETEC-p

**Magnification:** 1.-Back - Scattered Electron Imaging (BSEI) 450X 2.- Spectrum XEDS -SEM image 1

**Description:** 1.-Image of a section of the sample. Electron microscopy to observe the inner metallic ring

is mainly composed of massive compact iron sulfides (pyrite), and is surrounded by a layer of calcium carbonate. But it has a yellowish core and spray with some degree of disaggregation, probably due to alteration processes of iron sulfide minerals (pyrite) that make up the inner core.

---

### Associated Pathologies

Granular disintegration, sanding, flaking

---

### Other Tests



X ray radiography

---

### Observations

X ray radiography. Diferencia Note the density and brightness of different layers: The outer brighter corresponds to the concretion of calcium carbonate. The interlayer less bright, gray - brown is corresponding to a metal ring mineralized. The darker background layer with black dots are the remains of the wood.

---

### Bibliography

- Lyndsie Selwyn. Métaux et corrosion. Ed: Institut Canadien de Conservation (ICC). Ottawa –Canada. 2004.

- Colin Pearson. Conservation of Marine Archaeological objects. Ed: Butterworths. UK. Oxford 1987.

---

### Author

Jose Luis Prada Pérez. prada43@wanadoo.es

Geologo

---

**Institution or Company**

ESCRBCC

---