National Technological Center
for Mercury
Decontamination

GOBIERNO
DE ESPAÑA

MINISTERIO
DE MEDIO AMBIENTE,
Y MEDIO RURAL Y MARINO


National Technological Center
for Mercury
Decontamination
Hg
Life
MERSADE
(LIFE06 ENV/ES/PRE/03)

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MERSADE STABILIZATION PROCESS:

As a form for the permanent storage of mercury

Patent : P200930672

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1.- Transformation of liquid mercury in HgS (metacinnabar) by reaction between liquid mercury and elemental sulfur, using the mechanical energy supplied by a planetary ball mill.



Metacinnabar

2.- Incorporation of metacinnabar into a polymeric S-concrete matrix composed of gravel, sand, filler, elemental sulfur and modified sulfur to obtain a final material similar to a concrete.

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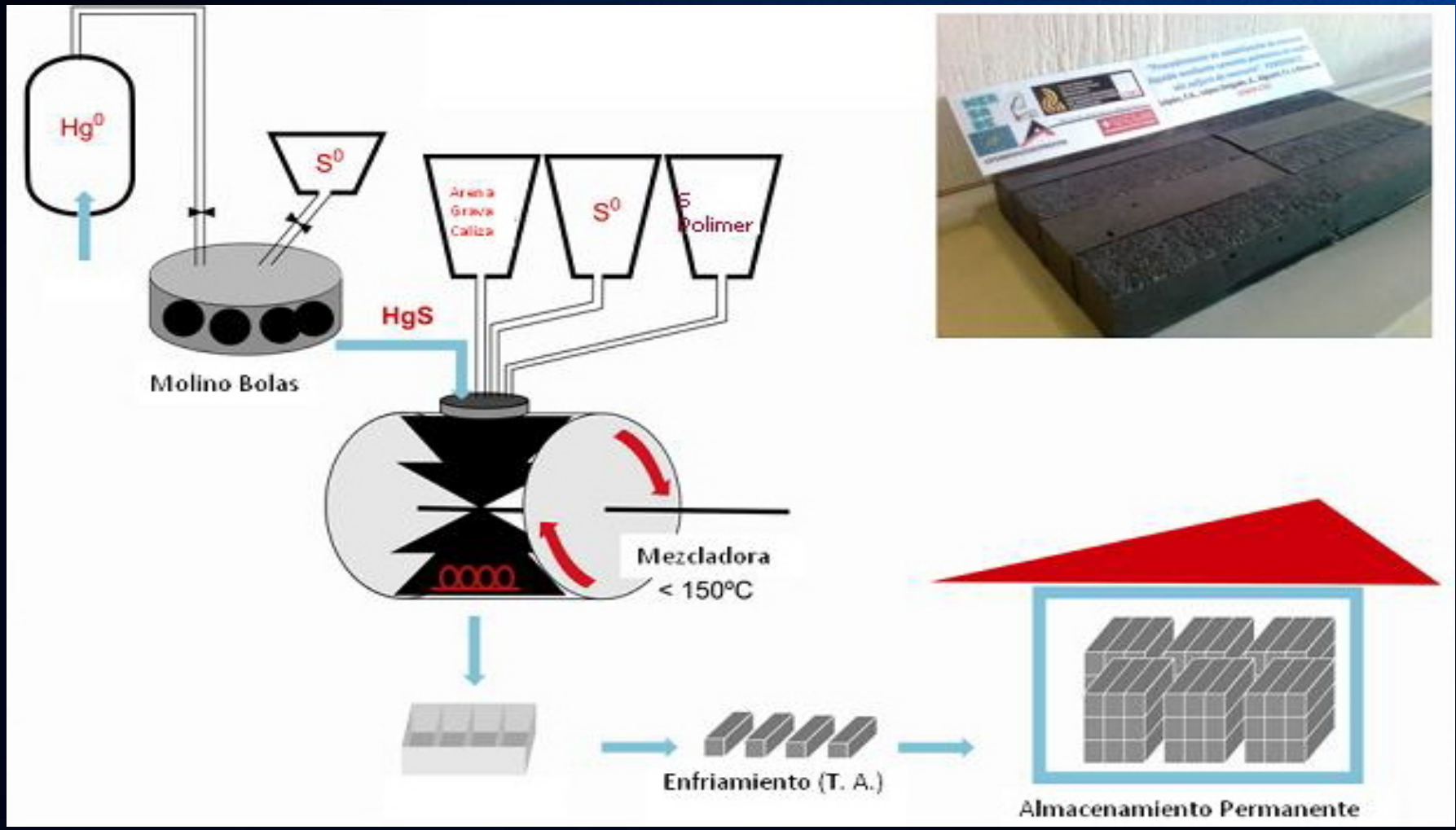

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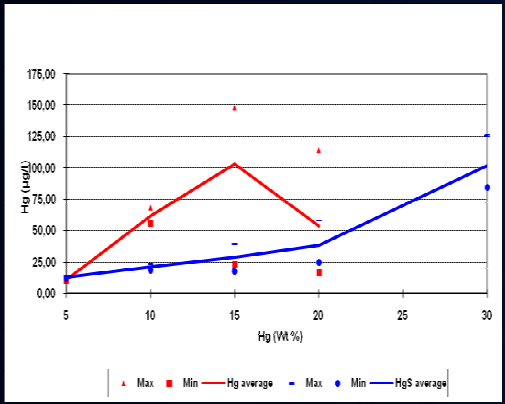
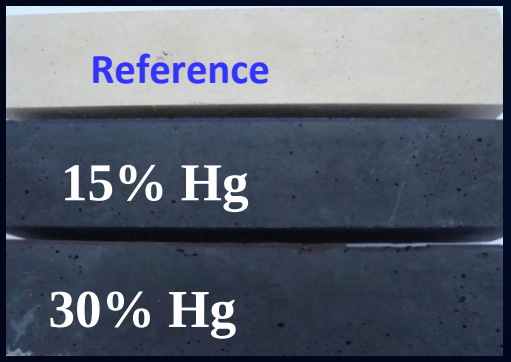
FINAL PRODUCT: **Monolithic sample (rectangular parallelepiped of 16x16x4cm).**

TOXICITY TESTS:



- Leachability test TCLP (EPA1311) (on crushed samples):

The content of Hg in the leachates is ~100 µg/l, lower than the maximum value accepted as limit for mercury in the Resource Conservation and Recovery Act Regulatory (200 µg/l)



- Hg emissions:

Mercury emission of samples were lower than those of cinnabar (100-150 times) and metacinnabar (15-20 times)

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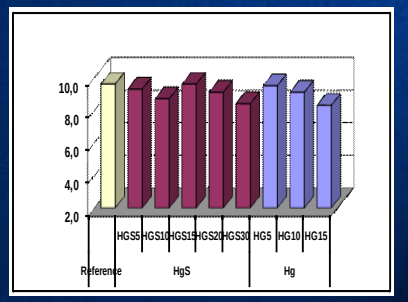
- **Mechanical properties: (UNE 196-1:2005)**
  - -Very high resistance to compression (> 55 Nmm^2)
  - - High flexural resistance (>8.5 Nmm^2)



- **Physical Properties:**
  - - Very Low porosity (P_T= 1.97%)
  - - Very low pore volume (V_p=0.63x$10^{-2}$$cm^3$/g)
  - - Very high density: 3.181 gr/cm^3 for content of 30 % Hg w/w

- **Hydrical properties:**

-Water Absortion under low pressure **(RILEM N.4):** negative. Rain drops at high velocity will not modify the surface of the sample.

-Water Absortion by Capillarity **(UNE-EN-480-5):** Extremly low capillarity coeficient (0,07 gr/cm^2) very low permeability

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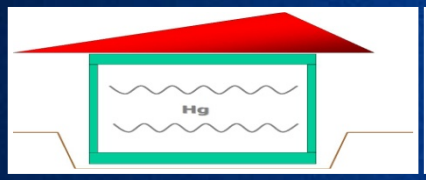

Life

Durability

***Water absorption and resistance to alkali for hydrophobic impregnations** UNE-EN 13580:2003

The water absorption coefficient is very low →a high resistance to alkali.

***Resistance of ageing by salt mist** UNE-EN 14147:2003

The samples exhibited good aspect without cracks, scales or other kind of external damage or degradation

***Determination of freeze-thaw resistance** ISO 20394: 2007

The samples exhibited good aspect after test, without cracks, scales or other kind of external damage or degradation

- **Resistance to direct fire EN-ISO-11925-2:2002: passed**

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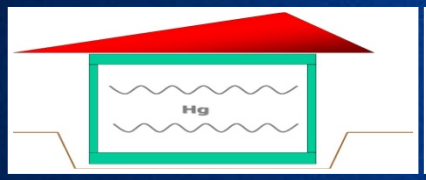

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CONCLUSIONS:

In respect to the process:

- It is conducted under dry conditions; there is no water consumption, nor effluents, nor any solid waste.
- 100 % metallic mercury is transformed into an inert solid material. The hazardousness of this metal disappears.
- No curing or aging times are required for the final product.
- Raw materials and reactives are cheap.
- It is conducted under normal atmosferic conditions. The biggest energy consumption is related to the heating of material to 140 º C.

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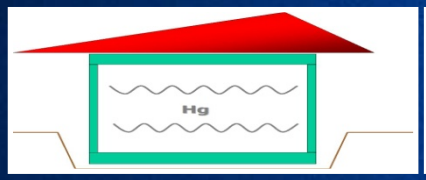

CONCLUSIONS (II):

In respect to the final product:

- The polymeric matrix eliminates the leaching and emissions of mercury to the ground, to the water and to the atmosphere, offering good environmental guaranties.

- The final product displays excellent physical and mechanicals properties, along with excellent behaviour in different agressive environments guranteeing its safe permanent storage.

- It is flexible in terms od its dinal shaping: monolithic blocks/bricks, or any other shape depending on the final destination.

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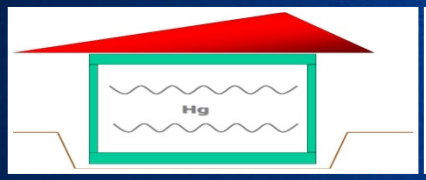

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CURRENT ESTIMATED COST AT THE EUROPEAN UNION:

EUR 3500 to 4000 / t Hg.

(Including: collection, transport, estabilization process and final disposal.)

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GRACIAS / THANKS