NEW EXPECTATIONS: BIOARCHAEOLOGICAL SUPPORT

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Abstract. Guanche mummies are part of the Canarian and Spanish bio-heritage. These Mummies are so fragile and susceptible to deterioration, that need arises to develop adapted supports in a customized way. In addition to providing different levels of discharge appropriate to the requirements of each mummy, this kind of support prevents direct handling. This paper presents a first study on new inert materials that be used to build these new supports to determine if their performance over time is compatible with the mummified biological component. Thais prototype support is to be used for the mummy NEC 2, which is a part of the collection at the *Museum of Nature and Man* [Museo de la Naturaleza y el Hombre] of Tenerife.

Keywords. Preventive conservation. Bio-heritage, guanche mummies, inert materials, adapted supports.

1. INTRODUCTION

Guanche mummies are part of the last vestiges of the Canarian prehispanic heritage and therefore, there is a great interest that encompasses three different areas: scientific, patrimonial and social. For that reason, the importance of conservation of these remains are essential for the continuous development of research, linked to the Canary Islands own heritage, which historically is extrapolated to the remains of the peninsula.

In this case, focusing on the individual NEC 2 and its current padded aluminium exhibition system, it can be determined that the entire weight of this mummy is splatted into only two very specific points of support. Given its state of conservation, this can be considered as inappropriate, with wear and causing general drying, in addition to the stiffness of organic matter; therefore, the degree of fragility is very high, so on performing any type of manipulation linked to the investigation or the actual transfer of the remains, however careful this may be, the mummy, due to its susceptibility will suffer an accelerated deterioration that can be fatal.

By relying on new technologies, this investigation intends to develop ergonomic supports adapted to the shape and needs of each individual, so as to avoid deterioration every time they are subject to any movement or manipulation. For this reason, it is necessary to study new innocuous materials that meet the desired features in order to make a suitable prototype of support specifically for NEC 2.

2. METHODOLOGY

2.1. Selection of study materials

Regarding the materials selected for this first study, a series of parameters related to the needs of NEC 2 were taken into account.The materials that make up these customized supports can be divided into 4 groups by natur: plastics, silicones, foams and textiles. (Table 1).

2.2. Preparation of test samples

The preparation of all the test samples was different according to their nature. Having a determined area of 30 mm2 (UNE-EN ISO 29664).

- The plastic supports were made by 3D printing at a size of 60 × 50 × 0.5 mm.
- The silicones were made by direct mold of rubber being its size 60 × 50 × 0.5 mm, at an ambient temperature of 22° - 25°.
- Foams and fabrics were cut to the same size as the rest of the test pieces, but in the case of the fabric the thickness does not reach 0.1 mm.

Table I. Selection of materials, type, composition and specific use.

Material	Type	Composition	Specific use	Nomenclature
Plastic	HIPS	High impact polyethylene	Support	HIPS
Plastic	PETG	Polyethylene Terephthalate glycol.	Support	PETG
Silicones	Aquarium sealer Bostik®	Acetoxi	Intermediate layer	S.A
Silicones	Food Grade Sealer Bostik®	Neutral oxime	Intermediate layer	S.AC
Silicones	Silicone MS liquid		Intermediate layer	S.N
Foam	Polyethylene	Polyethylene	Soportante	Polyethylene
Foam	Viscogel	Viscoelastic	Soportante	Polyethylene
Textil	Textil	Cotton	Finish	Textil

A total of 81 samples were made, divided into 9 mothers and 72 for a summary. Organized by materials, this species received a specific nomenclature for carrying out the tests.

Finally, all the plastic supports were subject to a surface sanding and polishing.

2.3. Instrumentation

2.3.1. Spectrophotometry

MINOLTA® CM-2600d spectrophotometer, standard D65 illuminist measurement conditions, 10° pattern observer and excluded specular component (SCE). These measurements by surface contact of each specimen before and after the tests, allowed the determination of the chromatic variations suffered during the aging tests by irradiation of ultraviolet light.

2.3.2. Accelerated aging

QUV accelerated aging camera by ultraviolet irradiation, model Accelerated Weathering Tester. It uses 8 UVA 351 LAMP lamps that produce UV wavelengths with a maximum intensity of 350 nm, 4 lamps on each side.

Chamber of aging accelerated by humidity and temperature, in chamber of corrosion model VCK-300 of the DYCOMETAL brand.
OHARUS® Scout ™ balance.

2.4. Procedure of aging tests

- Three specimens from each group were subjected to accelerated aging tests by ultraviolet radiation for 360 h at 45° C.
- Two specimens from each group were subjected to three 360h cycles of accelerated aging at different T / HR% parameters.
- Current environmental conditions in the museum.
- Currently, NEC 2 is in the museum at an average temperature and relative humidity of 20.80° C and 48.49 HR%. Therefore, the measures tested are 21° C and 50 HR%.
- Extreme environmental conditions.
- As extreme conditions, the decision has been made to take twice as many of those mentioned above, 42° C and 100 HR%.
- Low environmental conditions, 15°C and 30HR%.

3. RESULTS AND DISCUSSION

3.1 Instability versus UV aging

- Qualitative results:

Some of the materials used in these tests appear to be relatively stable as a whole, while others present both chromatic and mechanical drastic changes.

The specimens where the changes have been shown:

- Industrial food silicone: presents an evident blackening in the area exposed to UV radiation.

- Viscogel foam: yellowing and aging in mechanical functions, being extremely brittle, losing 8% of its volume.

- Textile: does not show apparent colour changes, but there is considerable disaggregation of the material in the exposed area.

- Quantitative results obtained by Colorimetry.

A noticeable colour difference was determined by CIELAB units for three of the materials, two of them remaining stable in the same total colour, while the rest of the specimens did not show perceptible changes.

Viscogel foam, accumulated a difference of ≈62 CIELAB units, the food silicone ≈9 CIELAB units and finally the PETG that showed a variation of ≈8 CIELAB units.

As for the most stable specimens in colorimetric terms, the Bostik® aquarium fabric and silicone stand out, in which no differences are observed in the respective CIELAB units, which have a value of ≈0.

3.2 Stability to natural agent T / HR

These aging tests accelerated by T / HR, they were carried out jointly with specimens of the new materials destined to the new supports as mummified material.

The specimens subject to the current atmospheric conditions in the Museum of Nature and Man of Tenerife (MNH), which were provided by the museum itself. Being measured by a sensor of T° C and HR% SENSONET®, are of an average monthly of 20.80° C and 48.49% RH with oscillations of ± 3. They do not present qualitative changes after exposure to these environmental factors.

For specimens submitted to extreme atmospheric conditions of humidity reaching 100% of RH in 24h cycles. During 6 days (Graphic 2), the materials did not modified the qualitative factors after exposure, but if in terms of absorption, the percentage of weight gain has been calculated by the formula: Wg=100 ($Ww-Wdry$) in which Wg being the weight of the wet specimens and $Wdry$ being the weight of the dry specimen.

The most hygroscopic material is the viscogel that shows a weight gain of 0.3 mg.

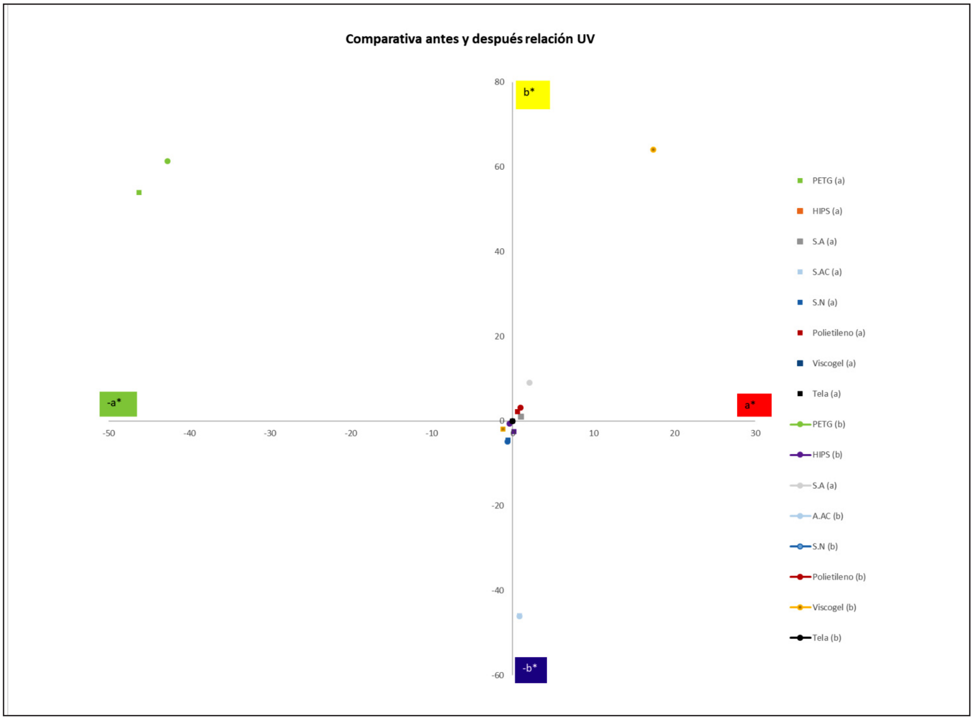
The specimens are some sequence weather conditions, some of the materials presents changes.

- Viscogel foam present yellowing as chromatic changes but not mechanic deterioration.
- Industrial food silicone presents an evident blackening.
- Black Silicone presents volume contraction and deformation.

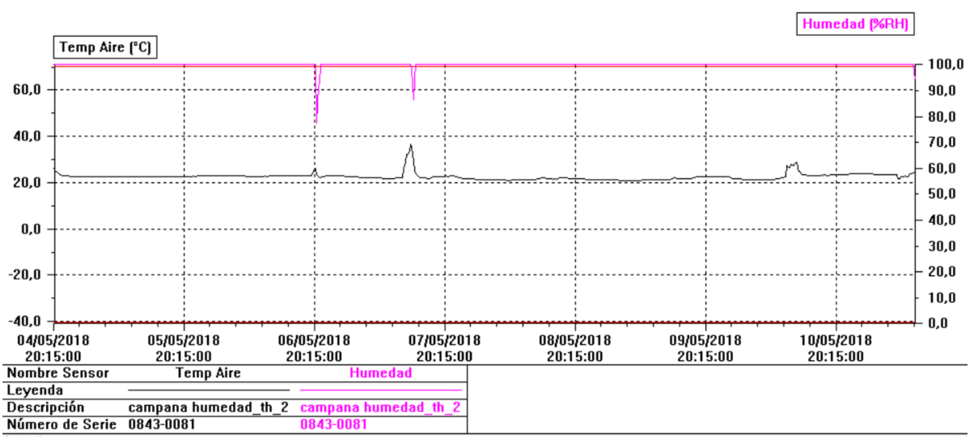
4. FINDINGS

The study is based on accelerated aging of the specimens in UV irradiation and Tª/HR% Chambers, which has allowed to know the different behaviour among materials of the same nature and their chromatic and structural changes.

Materials that do not meet the requirements include S.A, Textil and Viscogel; since their behaviour in the ultraviolet aging chamber has not been adequate. They are presenting changes at the surface colour and in the case of textile and viscogel they also show structural degradation caused by material disaggregation. As for the materials that have presented a good response to the acceleration aging pro-



Graphic 1. CIELAB graph showing the chromatic values of the test specimens before (represented by ■) and afterwards (represented by ■) of the UV aging tests.



Graphic 2. T/HR% inside aging chamber.

cesses, we can mention the S.AC, polyethylene, HIPS, and PETG, which do not either chromatic changes and no structural damages.

The obtained results highlight that the materials have behaved with relative success, allowing us to discriminate among this materials of the same nature that have not reached a correct behaviour with the selected parameters. Thanks to this selection it will be possible to continue with the following studies focused on the compatibility between them and with the mummified material.

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