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Índice

TECHNICAL ART HISTORY

Tale of two industries: The manufacture of bottle and window glass in England from the 17th to the 20th centuries .......................... 9
Cobalt and potassium structure and degradation pathways in painted works of art .......................................................... 11
Renaissance Venetian enamelled glass. An analytical investigation to understand their technology and to distinguish genuine from copied artefacts ................................................. 14
Overview of glass chemistry and technology in late antique Cyprus .......................................................... 16
The use of glass in medieval pigment making .......................................................... 19
Hispano-Moresque architectural glazes in the context of medieval glass technology .......................................................... 22
Investigating a Byzantine technology: experimental replicas of Ca-phosphate opacified glass .......................................................... 25
Thermal properties of the modernist enamels and stain glasses from the city of Barcelona .......................................................... 26

GLASS IN ARCHITECTURE

The creative process of applying grisaille in stained glass .......................................................... 31
Stained glass iconostasis: fragile ‘Munich Glass’ in Ukraine .......................................................... 34
New development: mouth blown UV protective window glass .......................................................... 37
Glass as an artistic material on exterior façade in 21st century architecture .......................................................... 41
Architectural glass in the 18th to 20th centuries in Iran .......................................................... 43
The detriments of the contemporary stained glass from Estonia .......................................................... 46

Scottish medieval monastic and ecclesiastical window glass .......................................................... 48

ART

Glass: the medium and the metaphor The crossover approach of the glass museum GlazenHuis .......................................................... 51
Glass sculptures meet public in public spaces .......................................................... 53
Glass foam works created from recyclable glass bottles, conservation vessels and waste glass paints .......................................................... 55
Production and application of ceramic decal technology on vitreous substrate .......................................................... 58
Reflection and illusion in glass art; mastering artist Jin Hongo and his works .......................................................... 61
The contribution of the science of glass to the artistic expression .......................................................... 63
A glass garden .......................................................... 64
Coloring studio glass by metal oxides .......................................................... 65
‘Inside Painting’ suggested as a new model for contemporary glass art .......................................................... 66
Red glass revisited – a short review of the work made in Vicarte Laboratories .......................................................... 67

ARCHAEOLOGY AND ARCHAEOMETRY

Vidros da terra - Glass from the Earth The contribution of archaeology to the history of Medieval and Early Modern glass in Portugal .......................................................... 70
Origins of stained glass in the great east window of York Minster, UK .......................................................... 72
Analytical investigation of 14th century stained glass windows from Santa Croce Basilica, Florence. Glass types and weathering phenomena .......................................................... 73
Study of Picenes Beads from two Iron Age necropolises .......................... 76
Glass recycling in the first millennium AD: a spatial-temporal approach .......... 78
Archaeovitreological analysis by PIXE/PIGE of glass fragments from Miranduolo, Chiusi, Italy ......................................................... 80
Analytical investigation of Renaissance Venetian enamelled glass: Potential and limits of portable X-ray fluorescence .................................. 82
Preliminary non invasive study of Roman glasses from Jesolo (Ve), Italy ........... 85
Chemical and textural investigation of the glass tesserae from the baptistery of Tyana (Khemerisar) - Turkey ...................................... 86

CONSERVATION

Conservation of glass at the Corning Museum of Glass: training and future developments ................................................................. 89
Maintenance and safeguarding of stained glass windows ................................ 91
Thermographic analysis of glasses, enamels and grisailles from stained glass windows ............................................................... 94
Final results of analysis of a 15th century stained-glass panel “The Throne of Grace” from the Dominican Monastery in Kraków, Poland .......... 97
Surface roughness impact on medieval stained glass alteration ................. 100
Corrosion patterns of a historical glass collection from Greece .................. 103
Research of a chemical treatment based on zinc salts for ancient glass objects sensitive to atmospheric degradation in museums .......... 106
Protecting historic window glass in Scotland - a look at planning application approval rates over a 10 year period .................................. 109

19th century stained-glass windows of two mausoleums from Belém do Pará, Brazil: a characterisation study ........................................ 110

Organic Surface Coatings on Medieval stained glass and microbiological investigation ................................................................. 112
POST-ROMAN GLASS IN THE IBERIAN PENINSULA
Vidro pós-romano na Península Ibérica
Vidro post-romano en la Península Ibérica

The glass from Recópolis: an analytical approach ................................ 116
Caracterización y comercialización del vidrio en la periferia de al-Andalus
(Ciudad de Vascos, Toledo) ......................................................... 118
Chemical characterisation of Islamic glass from Silves Castle (Portugal) ....... 120
The al-Andalus Glass Project: Production and Invention in Medieval Iberia 122

Aproximación al contenido de un ungüentario andalusí por GC-MS
(Albalat, Extremadura, s. XII) .......................................................... 124
Medieval Glass from Santarém (14th-15th centuries) ................................ 125
Beber a la Moda: copas, tazas y otros materiales arqueológicos en Mallorca (1500-1700) ......................................................... 126
Vidrios, do sé culo XVI, do Poço-Cisterna de Silves ............................. 128

Potassium-rich glass in Lisbon in the 18th century .................................. 129
Vidro e sociedade. A vidaria da estação arqueológica do palácio dos marqueses de Marialva nos sucessivos contextos sociais, laborais e económicos sucessivamente documentados (séc. XVII – início do séc. XIX) ......................................................... 132
The vase offered to D. Armélia de Orléans by Émile Loubet ..................... 133
Chemical characterisation of Islamic glass from Silves’ Castle (Portugal)

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Field of interest: archaeometry, archaeology, Islamic Iberia

Abstract
Archaeological excavations conducted by one of us (RVG) since 1984 at Silves’ Castle (Portugal) yielded a significant eleventh-to-thirteenth-century glass assemblage. A representative cross-section of different artefact types from different well-stratified contexts was selected for LA-ICP-MS analyses. We present the analytical results as a function of the different vessel types (goblets, bowls, jugs, jars and small flasks) and different colours.

Keywords: Silves’ Castle, Islamic glass, Gharb al-Andalus, Medieval fortifications

Introduction
The excavations of the early medieval fortifications of Silves’ Castle produced substantial glass finds (Gomes, 2003). Typological evidence suggests that some of the glass objects might have been produced on the Iberian Peninsula, whereas others might have been imported from Syria and Egypt (Gomes, 2015). This raises the possibility that Silves was well integrated into the commercial networks of al-Andalus and connected via long-distance trade to the eastern Mediterranean.

A series of glass vessels from different contexts have been analysed for major, minor and trace elements in order to establish the chemical characteristics of the glass finds and to elucidate the relationship between vessel types and base glass composition. This will allow us to explore the geographical and chronological dimensions and key developments in the use of glass in late Islamic Silves.

Methodology & Results
The glass fragments were analysed by laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) at the Centre Ernest-Babelon of the IRAMAT (Orléans, France), using an Element XR mass spectrometer (Thermofisher) and a RESOlution M50e ArF excimer laser probe ablation device (Resonetics) as described in Gratuze (2016) and Schibille et al. (2016).

The analytical results will be compared to compositional data of glass from other Iberian sites such as Cordoba, Murcia, Pechina and Vascos (Duckworth et al., 2012; Garcia-Heras, 2008; Jiménez Castillo 2000 & 2006; de Juan and Schibille, forthcoming). This will significantly improve our understanding of the chemical characteristics of principal glass groups in circulation on the Iberian Peninsula during the Islamic period. A high chronological resolution of the glass finds will enable us to refine the temporal developments of glass production in Iberia and its relationship to Palestinian and Egyptian glass manufacture.

References
De Juan, J. and Schibille, N. (forthcoming): La Hispania antigua y medieval a través del vidrio. La aportación de la arqueometría, Boletín de la Sociedad Española de Cerámica y Vidrio.
Casa de Velázquez, Fundación Centro Nacional del Vidrio, 117-148.

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