FIXLAB PLATFORM B – MTA Atomki

TRANSNATIONAL ACCESS APPLICATION FORM

To be sent to
iperionch@atomki.mta.hu and co@iperionch.eu

1) **Project Title** Characterization of the Medieval glass artefacts from Miranduolo site, Chiusdino, Italy

2) **Acronym** *(max 20 characters)* MEGLARTMIT

3) **Group Leader** *(All correspondence concerning this proposal will be sent to the Group Leader)*

Family Name	**Posedi**	**First Name**	**Ivona**
Nationality	**Croatian**	**Birth year**	**1989**
Gender	**x female** ❑ **male**		
Home Institution (HI)	**University of Evora**		
HI Legal Status Code[1]	**UNI**	**HI Country Code**[2]	**PT**
Function / Job / Title	**Student**	**Position Code**[3]	**PGR**
Mailing address	**Via Giovanni Giolitti 239, 00185, Rome, Italy**		
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[1] **UNI**=University, **RES**=Public Research Organisation, **SME**=Small or Medium Enterprise, **PRV**=Other and/or profit or not profit Private Organisation, **OTH**= Other Organisation

[2] **AL**=Albania, **AT**=Austria, **BE**=Belgium, **BG**=Bulgaria, **CH**=Switzerland, **CY**=Cyprus, **CZ**=Czech Republic, **DK**=Denmark, **EE**=Estonia, **FI**=Finland, **FR**=France, **DE**=Germany, **GR**=Greece, **HR**=Croatia, **HU**=Hungary, **IS**=Iceland, **IE**=Ireland, **IL**=Israel, **IT**=Italy, **LV**=Latvia, **LI**=Liechtenstein, **LT**=Lithuania, **LU**=Luxembourg, **MT**=Malta, **MK**=Macedonia, **ME**=Montenegro **NL**=Netherlands, **NO**=Norway, **PL**=Poland, **PT**=Portugal, **RO**=Romania, **SK**=Slovakia, **SI**=Slovenia, **ES**=Spain, **SE**=Sweden, **SR**=Serbia, **TR**=Turkey, **GB**=United Kingdom

[3] **UND**=Undergraduate, **PGR**=Post graduate (student with a first University degree or equivalent), **PDOC**=Post-doc researcher, **TEC**=Technician, **EXP**=Experienced researcher (professional researcher).

4) Other User Group participants involved in the Proposal *(please, fill-in all the cells following the example written in blue)*

Family Name	First Name	Gender M/F	Birth year	Nationality	Background	Function /Job/Title
Gigante	*Giovanni*	*M*	*1948*	*Italian*	*Physicist*	*Full Prof. of Applied Physics at Department SBAI of Sapienza University of Rome*
Home Institution (HI)		**HI Legal State (1)**	**HI Country (2)**	**Position Code (3)**	**e-mail address**	
Sapienza University of Rome		*UNI*	*IT*	*EXP*	*giovanni.gigante@uniroma1.it*	

Please add as many users as necessary, via copied extra tables

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5) This is *(tick ☒ the correct item)*

x A SINGLE FACILITY PROPOSAL addressed to MTA Atomki			
In particular:	x a new proposal	❑ a continuation	❑ a resubmission
❑ A MULTIPLE FIXLAB FACILITY PROPOSAL			
Involving also:	Platform B: ❑ BNC	Platform A: ❑ AGLAE ❑ SOLEIL	

6) Any other access proposal to ARCHLAB, MOLAB or FIXLAB requested or allocated under IPERION CH related to this project or User group?

❑ No x Yes (please specify) MOLAB for usage of Integrated XRD/XRF, UV-Vis fluorescence, Atomic force microscopy

7) Beamline:

❑ In-vacuum micro-beam x External micro-beam

8) Method(s) implemented*: (tick ☒ the item chosen)

x PIXE x PIGE ❑ RBS ❑ NRA ❑ ERDA
❑ STIM ❑ XRF

9) Experimental set-up*:

x Bulk analysis ❑ Elemental analysis with a micrometer lateral resolution

❑ Elemental mapping of main constituents ❑ Elemental mapping of trace elements

* The applied techniques and arrangements will be discussed together and fixed before the experiments. At this stage just indicate your ideas.

10) Sample description

Number:	90
Type:	Glass
Size:	Fragments of few centimeters
Surface quality:	uneven
	porous/solid
	Corrosion ; coatings not analyzed
Volatility in vacuum	No

11) Total Requested beam time

Specify the requested beamtime, number of days, and preferred period/s

Total requested beamtime(hours)	Number of days	Preferred month	Undesired month
90	14	April	February

12) Special remarks / requirements concerning the experiment (sample hazard, special treatments etc.)

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13) Project description (Scientific background- Experimental methods - Results expected and impact – References)

Project summary

The Master's thesis project for the Archaeological Materials in Science program will be the Characterization of the Medieval glass artefacts from Miranduolo site, Chiusdino, Italy. The project will have a wider scientific impact because the analysis will include fragments of colorless, yellow, yellow/brown, green, blue, purple, grey, black glass from diverse areas of the Medieval settlement with a temporal span from 7th to 14th century. This will provide a complete sequence of the glass procurement on the site. The PIXE-PIGE will later be combined with the integrated XRF/XRD, UV-Vis and Atomic force microscopy SEM-EDS and OM data.

Scientific background

Miranduolo site, near Chiusdino, Italy, dated from 7th to 14th century is a very well archaeologically investigated, with exceptional 85% of the site being excavated. Archaeometrical analysis performed on the materials from the site include only radiocarbon dating and pollen analysis. The contexts were dated relatively and absolutely, thus the glass finds have a secure context. There is no indication of glass production on the site, which would implicate that the glasses were imported from the production centers.

In Tuscany, several investigations have yielded results considering the Medieval glass production, but with a sequence of few centuries. These production centers might be connected to Miranduolo site, especially since the same glass colors have been analyzed. These are to be observed since the historical sources have witnessed the glass production from raw materials (Montelecco in Liguria, Germagnana in Tuscany), or from imported frits (San Vincenzo al Volturno). The raw materials used came from various sources, e.g. Sicily for the sand, Syria for soda ash.

Description of planned work

The PIXE-PIGE analysis will determine the bulk chemical characterization, existence of chromophores, deterioration signs such as corrosion, darkening and loss of transparency, and

chemical mapping of the glass, *grisailles* and deteriorations. Complementation of the two techniques is in PIGE's ability to precisely detect elements with Z≤13. Importance of the technique is in determining the presence and quantity/ratio of the following components: SiO_2, CaO, Na_2O, K_2O, MgO, MnO, CuO, Al_2O_3, Fe_2O_3, PbO, P_2O_5, TiO_2, As_2O_3, Sb_2O_3, CoO, ZrO_2, NiO, CdO, Cr_2O_3, Rb_2O, SrO, BaO, Ag, Au, SO_2, Cl^-. The XRF will provide the results for minor and trace elements, as a complementary technique to PIXE-PIGE. Combination of both PIXE-PIGE and XRF will promise good quantification results.

Scientific achievements and impact

The analysis will give scientific conclusions related to provenance, production techniques, trading routes, dating, authentication and deterioration signs. The data will be compared with the established regional production centers, e.g. Santa Cristina, Gambassi and Germagnana and historical sources. As no glass furnaces have been discovered at the site, possible trade routes could be proposed. It is expected that the early Medieval glasses will display Na composition, very similar to the Roman production, while later Medieval glass will display mixed Na-Ca composition. The spatio-temporal analysis will give insight of the possible diversities in the composition between the areas of the site as well as the expected change in the glass composition from 7th to 14th century.

References

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Cagno, S. et al. (2008) Compositional analysis of Tuscan glass samples: In search of raw material fingerprints. *Analytical and Bioanalytical Chemistry Volume 391, Issue 4,* 1389-1395

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Janssens, K. H. (2013). *Modern Methods for Analysing Archaeological and Historical Glass.* Chichester: Wiley.

Freestone, I. (1992) Theophilus and the composition of the Medieval glass. In: *Materials Issues in Art and Archaeology III*, eds Pamela B. Vandiver *et al.,* Pittsbourgh, Pennsylvania

Short curriculum of the Group Leader

Ivona Posedi holds a BA in Archaeology and Ethnology and Cultural Anthropology and MA in Archaeology from the University of Zadar, Croatia. During her studies she participated in excavations as a Field Archaeologist, Archaeological Field Technician, Site Assistant, Post-excavation Processing Coordinator at various archaeological sites with Univeristy of Zadar, University of Siena, Centre for Culture of Vela Luka with University of Cambridge. She participated in International Summer School ENVIMAT Preventive conservation of monuments and archaeological sites in the Mediterranean Basin, University of Ferrara; International Course Atapuerca and New Technologies, University of Burgos; Erasmus IP InterKras, Vrgorac; attended TECHNART 2015 and RAA 2015 conferences. Currently, Ivona is a scholarship awarded MSc student in Archaeological Science of the Erasmus Mundus ARCHMAT (Archaeological Materials in Science) Program. She did a summer internship at ICMA, University of Zaragoza under supervision of Javier Campo, PhD. Ivona's current projects are: Placas de Xisto with Hercules Laboratory, Evora; Pollen analysis of the Medieval Miranduolo site with La Sapienza University of Rome; and Characterization of the 19th century stained glass and grisailles of the UNESCO protected Cathedral of Burgos, Spain with ICMA, University of Zaragoza and University of Burgos.

14)

15) Main scientific field of the project *(Chemistry, Physics, Materials Science, Environment, Humanities, Social sciences, Engineering and Technology, Inf. Comm. Technology, Others*)

Humanities

16) Specific discipline *(specify among the above fields; ex.: field Chemistry- discipline Conservation; field Environment- discipline Environmental effects on art materials…)*

Archaeological Science

17) Any other EU project related to this proposal ?

❑ Yes x No If positive response, specify

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18) How did you hear about IPERION CH / FIXLAB?

❑ personal contact ❑ web page x conference ❑ article ❑ other (please specify)

Herewith I declare:

- that I accept that all the necessary actions regarding the safe transportation of samples/objects back and forth to the facility, insurance of the samples/objects, etc. are the responsibility of the users, and no associated costs can be refund within the project.
- that a Summary Report no later than 2 months after the experiment will be sent to MTA Atomki (iperionch@atomki.mta.hu)
- that it is intended to publish the results, which are obtained in connection with any FIXLAB activity related to the present proposal, in a renowned refereed international journal (preferably open access)
- that in any of such papers the support by the European Community will be acknowledged by a statement like *"Financial support by the Access to Research Infrastructures activity in the H2020 Programme of the EU (IPERION CH Grant Agreement) is gratefully acknowledged".*
- that an electronic copy of any of such papers will be sent to MTA Atomki immediately after publication.

Date 14th September **Group Leader Signature**

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