Raman and SEM-EDX analysis: The case of "Villa dei Quintili" in Roma

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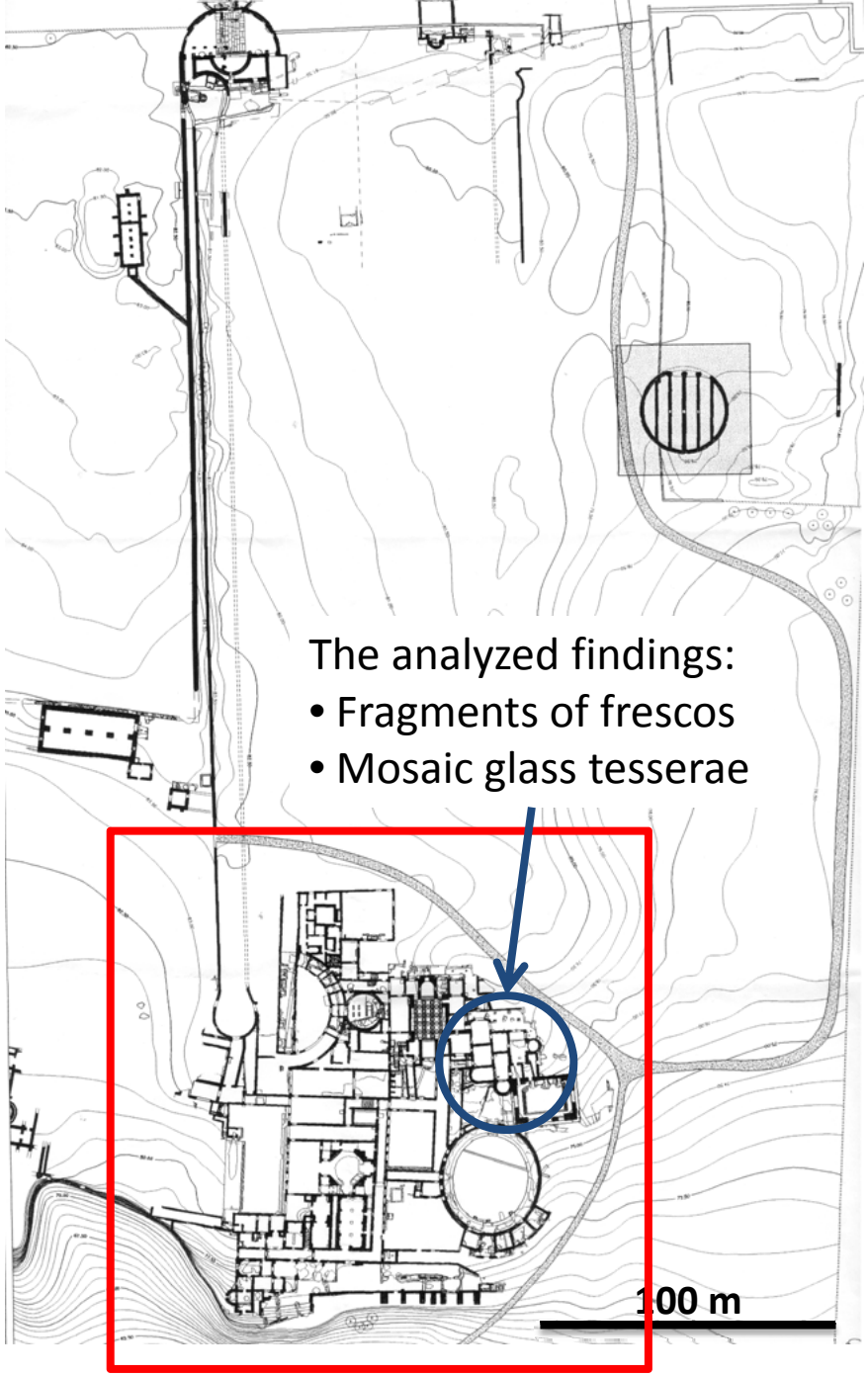
ARCHAEOLOGICAL SKETCH



Villa dei Quintili: this complex was built in the second half of the 2nd century A.D., and was expanded by the Emperor Commodo.
The most impressive part comprises the manor and the servants' quarter: a circular building, several rooms and the big thermal baths (i.e. *calidarium* and *frigidarium*), with wide windows and decorated with polychrome marbles.

THE ANALYTICAL TECHNIQUES

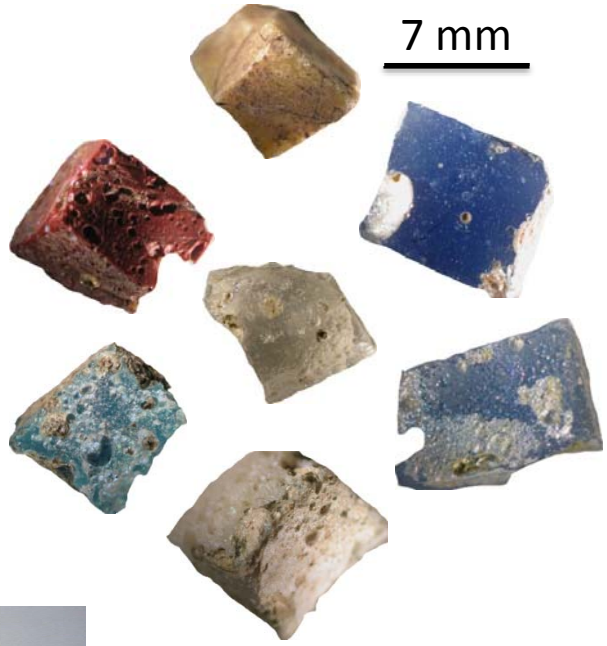
NON INVASIVE ANALYSES

MICROINVASIVE ANALYSES

Micro-Raman

SEM-EDS
LA-ICP-MS

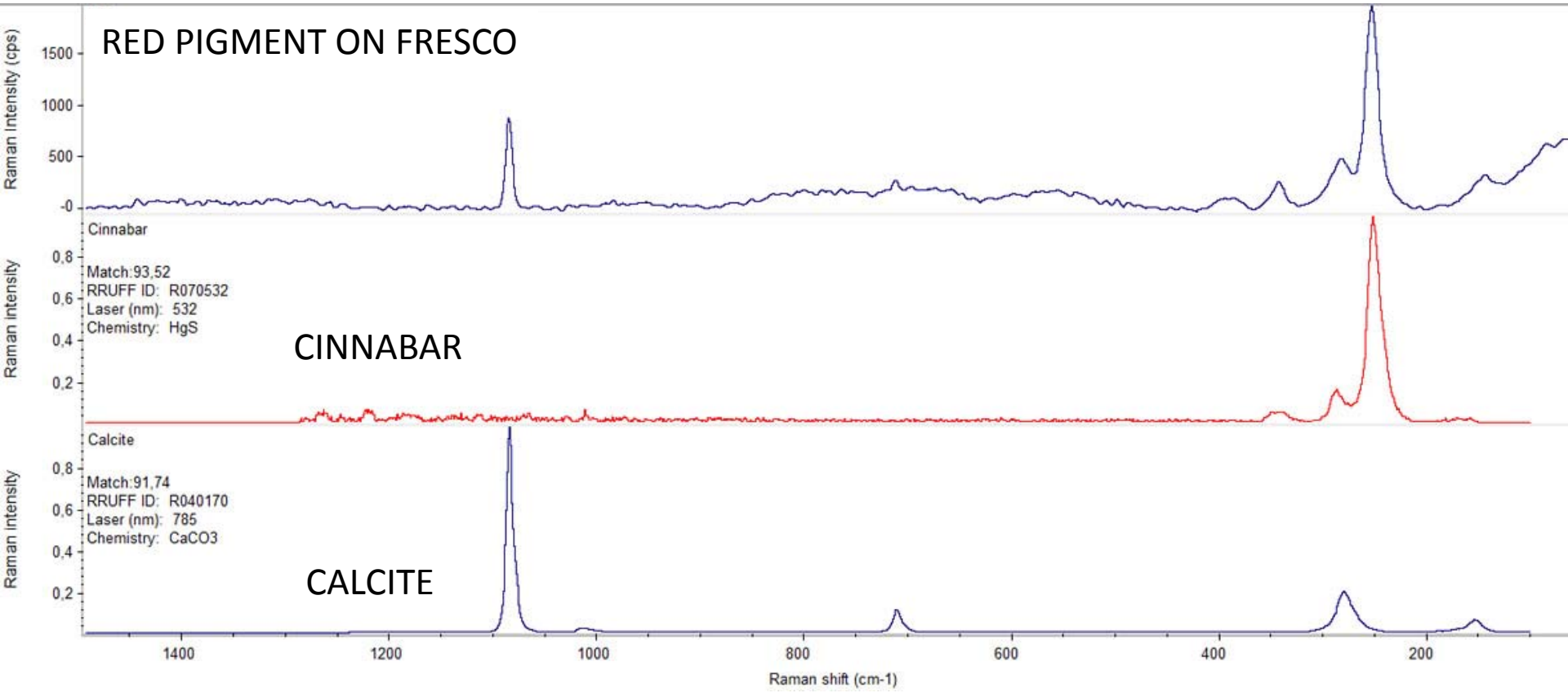
MOSAIC GLASS TESSERAE



FRAGMENTS OF FRESCOS

THE FRAGMENTS OF FRESCOS: THE RED COLOUR

Decorative mural painting from the inner of a manor's room. The pigment, identified with the micro-Raman technique, corresponds to the mercuric sulfide (cinnabar), as it completely overlaps the reference spectrum (in red). Notice also the presence of calcium carbonate (calcite), used as inorganic medium in the fresco technique.



THE GLASS OF THE MOSAIC TESSERAE

The Raman spectra on the mosaic tesserae evidenced the presence of two difference kind of glass. As an example, we report the spectra of the transparent glass (D2) and that of the red-coloured glass (H1).

The chemical data obtained by SEM-EDS and LA-ICP-MS techniques further support the compositional differences of these glasses.

SEM-EDS	D2	H1
	wt%	wt%
SiO2	70.15	56.46
Al2O3	2.70	2.36
MgO	0.49	2.15
CaO	5.38	7.22
Na2O	18.09	12.07
FeO	0.45	2.87
K2O	0.55	1.87
Cl2O	1.50	1.19
CuO	n.d.	1.20
PbO2	n.d.	11.71

LA-ICP-MS	D2	H1
	ppm	ppm
Ti	465.25	742.83
Mn	1562.62	2707.24
Fe	1972.14	15363.52
Co	3.25	12.66
Cu	31.44	7572.06
Ni	6.71	21.46
Zn	27.69	185.81
As	33.49	47.54
Rb	9.56	6.45
Sr	369.14	555.26
Zr	44.17	56.85
Ag	0.91	10.22
Cd	2.87	113.33
Sn	6.69	1647.96
Sb	4415.09	4220.70
Ba	180.99	221.56
Pb	177.63	88807.41