ESRF	**Experiment title:** **Polycrome Etruscan glass: continuity or change in the production techniques between protohistoric and historic ages?**	**Experiment number**: EC-42
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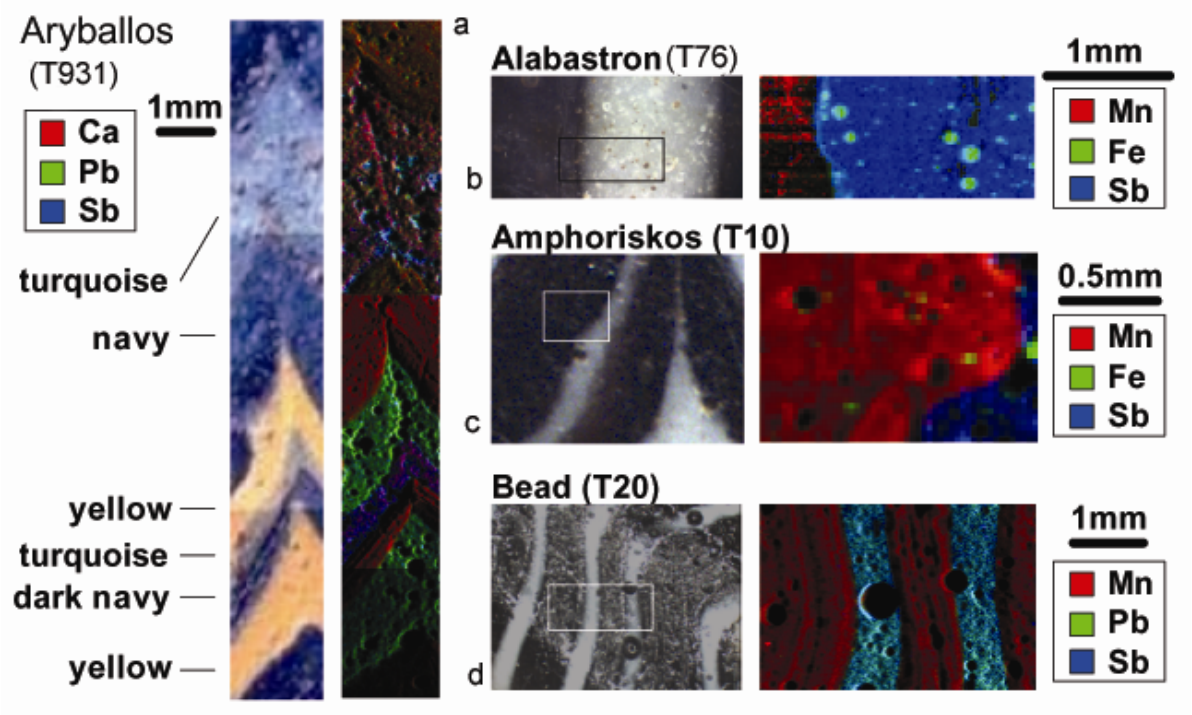
Report

In this experiment a suite of very rare, highly decorated and coloured glass vessels and beads from the VII to IV Century B.C were analysed. The most serious difficulty in developing this study was that any - even micro- sampling was absolutely forbidden. As a consequence, the mineralogical and chemical nature of chromophores and opacifiers present in these Iron age finds were identified by means of the following, strictly non destructive, techniques: micro X-Ray Fluorescence (μ-XRF), Fe K-edge micro X-ray Absorption Near Edge Spectroscopy (μ-XANES). The μ-XRF mapping evidenced high levels of Pb and Sb in the yellow decorations and the presence of only Sb in the white and light blue ones. Purple and black glass show high amounts of Mn and Fe, respectively. Fe K-edge μ-XANES spectra were collected in different coloured parts of the finds, thus enabling the mapping of the oxidation state of this elements across the samples. The results on Fe oxidation state indicate that two different situations, in both the beads and the vessels, are present. In a first group of samples (T931, T76, T20), Fe oxidation state is different between bulk glass, mainly containing Fe^{2+}, and decorations, where Fe^{3+} is dominant. On the contrary, the second group (T10 and TB1067471) does not show any variation in Fe oxidation state. This suggests two different manufacturing procedures. In the first case, vessels and beads were produced in different steps characterized by different oxygen fugacity. On the contrary the samples of the second group were produced and decorated under the same redox environment. In particular bead TB1067471, shows an

intimate mixing of blue and yellow parts, suggesting the contextual shaping of the two coloured components in an unique production step. Interestingly, since the *ateliers* of these artefacts are not documented, these different production techniques and furnace atmospheres could be indicators of different production sites.

The data obtained from the experiment allows us to conclude that the main colouring and opacifing agents used in the Iron Age were the same employed in the subsequent Roman age: calcium antimonates for white and turquoise opaque glass, and lead antimoniate for yellow and green opaque glass. The use of these colouring and opacifing agents is in agreement with that reported and well documented in literature.

Figure 1: elemental maps obtained by XRF on the analysed samples



The results obtained after this experiment are published in:

Arletti R., Vezzalini G., Quartieri S., Ferrari D., Merlini M., Cotte M. (2008) Polychrome glass from Etruscan sites: first non-destructive characterization with synchrotron μXRF, μXANES and XRPD. Applied Physics A, 92, 127-135.