Scientific Investigations on Ancient Glasses from Hanghaus I in Ephesus/Turkey using SEM/EDX and µ-XRF

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Abstract

Hanghaus I (Ephesus/Turkey), a Roman Insula containing private residential areas as well as public buildings dating from the late Hellenistic to the ancient/Byzantine period, has been subject of excavation activities since the sixties. From the great number of glass objects found in this complex 100 samples could be investigated using SEM/EDX (energy dispersive X-ray microanalysis) and µ-XRF (micro-X-ray fluorescence spectrometry). The samples were prepared as cross-sections, embedded in resin and ground and polished to 4000 mesh. The archaeological classification of the fragments yielded to 19 typological groups (TG, see table). Based on these results a statistical evaluation of the data using factor analysis could be carried out and reveal 12 chemical clusters (glass groups, GG) including 63 of the investigated samples.

Mean Chemical Composition of the Glass Groups

The glass groups 1, 2 and 5 can be compared with the Byzantine glass groups. Nevertheless, glass groups 2 and 5 show slightly higher concentrations indicated by a factor 2 in the range diagram. All of these glasses show a broad palette of colours, diminishing slightly in the 3rd century AD (GG11). They can be dated from the 3rd to the 5th century AD, especially GG11 shows a broad range of colours, mostly green/olive, yellow and dark brown.

The glass groups 6, 9, 10 and 12 almost exclusively show high amounts of FeO and Fe2O3 although the raw materials seem to be the same. They are from the 2nd century AD and 3rd century BC – 1st century AD respectively. It is interesting that the objects belonging to GG12 can be defined as “luxury goods” wide spread in the 4th century AD.

The glass groups 7, 8 and 10 differ almost exclusively in their high SiO2 which shows high amounts of CaO and TiO2. They are from the 2nd century AD and 3rd century BC – 1st century AD.

The glass group 3 shows quite different chemical compositions as can be seen in the range diagram. Nevertheless, all show high amounts of FeO and MnO and partly Ti, indicating that these glasses can be associated with the so called HIMT group.

The glass groups 4, 10, 11, 12 and 13 can be dated to the 3rd century AD, especially GG11 shows a broad range of colours, mostly green/olive, yellow and dark brown.

The glass groups 7, 8 and 9 show quite different chemical compositions as can be seen in the range diagram. Nevertheless, all show high amounts of FeO, MnO and partly Ti, indicating that these glasses can be associated with the so called HIMT group.

The glass groups 10, 11, 12 and 13 can be dated to the 3rd century AD, especially GG11 shows a broad range of colours, mostly green/olive, yellow and dark brown.

Discussion

The glass groups 7, 8 and 9 show quite different chemical compositions as can be seen in the range diagram. Nevertheless, all show high amounts of FeO, MnO and partly Ti, indicating that these glasses can be associated with the so called HIMT group.

The glass groups 10, 11, 12 and 13 can be dated to the 3rd century AD, especially GG11 shows a broad range of colours, mostly green/olive, yellow and dark brown.

The glass groups 7, 8 and 12 are very special because of their low Na2O content in combination with a high amount of Al2O3.

The quality of the raw materials is comparable to GG11. FeO, MnO and partly Ti, indicating that these glasses can be associated with the so called HIMT group.

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