Analysis of a Recent Bronze Age Amber Bead Fragment from the Site Punta di Zambrone

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Abstract: A fragment of an amber bead from the Punta di Zambrone site was analysed to find out the geographic origin of the raw material. The material was identified as succinite, a material, which in prehistory, could only be found on the coast of the Baltic Sea. Sicilian amber (Simetite) can be ruled out. Using fluorescence microscopy, corroded surfaces, which are a result of stratification in the soil, could be distinguished from modern fracture surfaces.

Keywords: Baltic amber, infrared spectroscopy, Punta di Zambrone, succinite

Three samples of one amber bead fragment (PZ66/P34, PZ66/P35)[2] were taken by using a scalpel. The weight of each fragment was not more than about 0.1–0.2mg. One part was taken from the outer corrosion zone, two samples from a supposed modern fraction plane, meaning the former inner, non-corroded material, the bead.

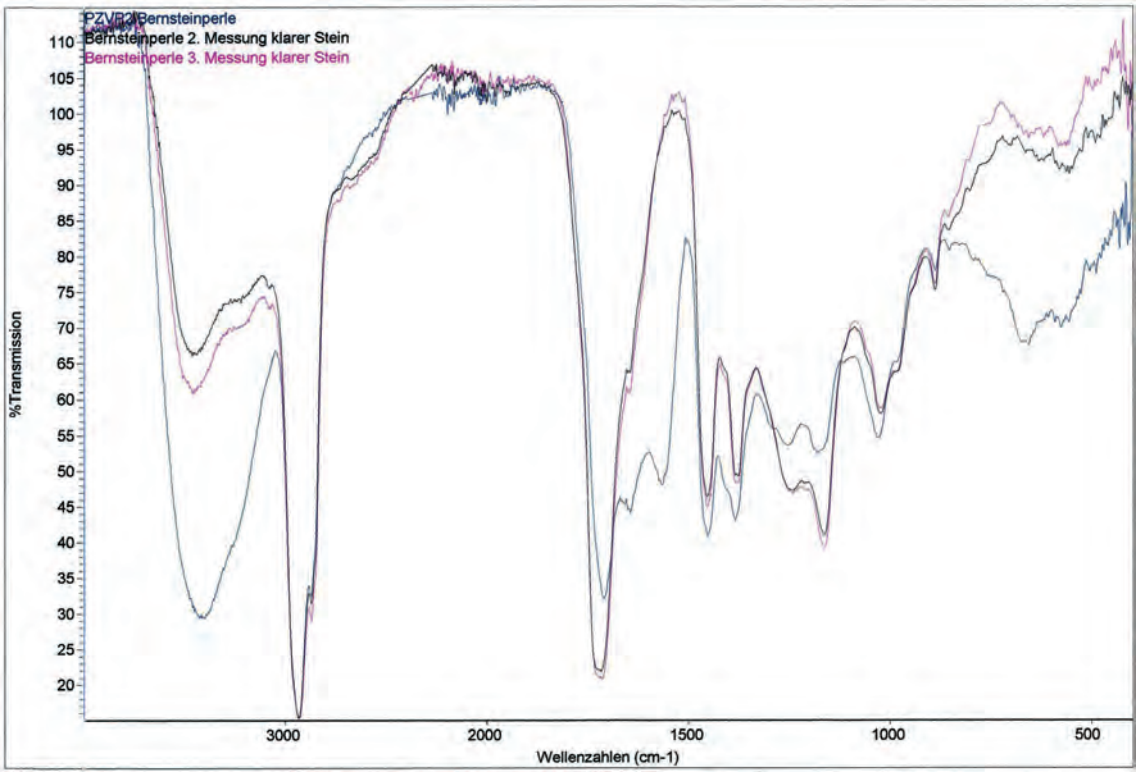


Fig. 1 Infrared spectra of the bead material (PZ66/P34, PZ66/P35). Blue curve: sample taken from the corroded surface; black: sample taken from the fraction plane; pink: sample taken from the fraction plane (graphics: D. Hirschfelder)

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[2] For the bead PZ66/P34, PZ66/P35 see Jung – Pacciarelli, this volume, fig. 25.

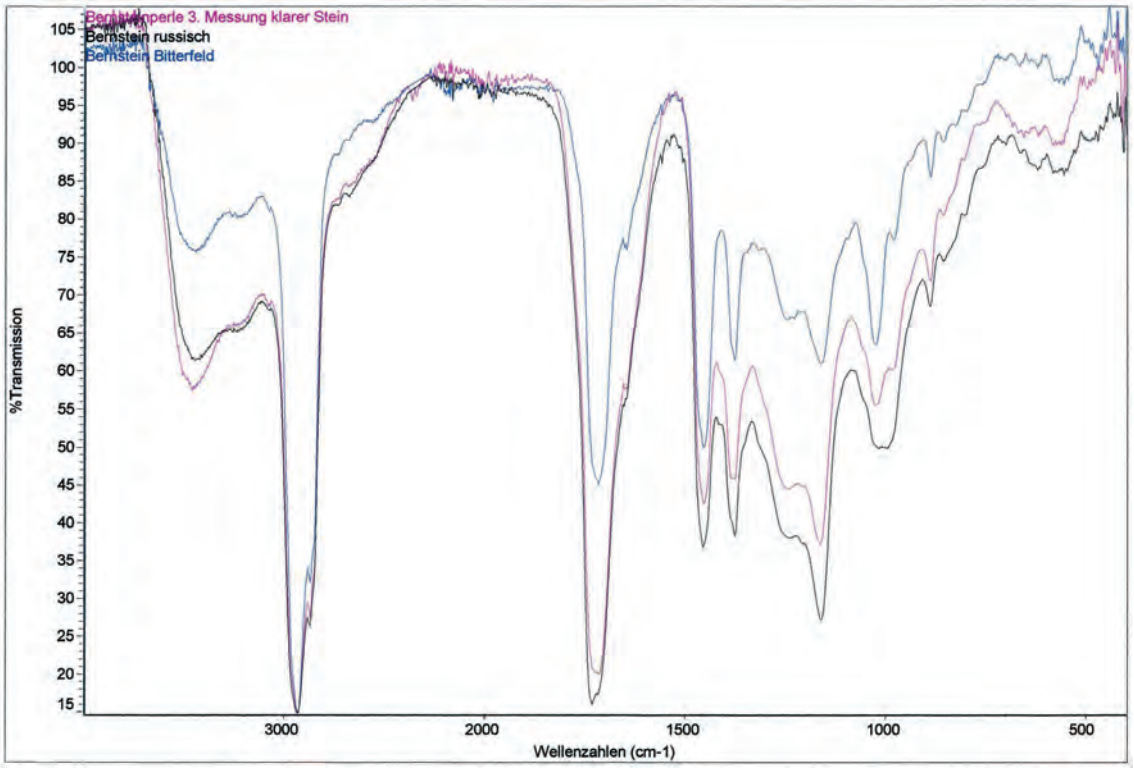


Fig. 2 Infrared spectra of amber from the Baltic Sea (black curve), amber from the mine of Goitsche (Bitterfeld) (blue curve), and sample material of non-corroded fraction plane of the bead PZ66/P34, PZ66/P35 from Punta di Zambrone (graphics: D. Hirschfelder)

The most frequently applied method for identifying different sorts of amber is infrared spectroscopy (IR).[3] The amber fragments were placed on the surface of an infrared diamond window, flattened under high pressure and analysed using a transmitted infrared beam.

The transmitted infrared light was split by the spectrometer using a grid, giving a wavelength-dispersed spectrum, and this was measured by an infrared-sensitive detector.

Each of the three samples was measured in this way. The resulting infrared spectra are shown in Fig. 1.[4]

In addition, reference material was measured in the same way. The reference material came from the Baltic Sea (sold by Kremer-Pigmente, Aichstedten) and from the amber-mine 'Goitsche' near Bitterfeld/Germany (the author's collection). With regard to geological aspects, both ambers are the same, i.e. the so-called succinite or 'Baltic amber' (Fig 2).

Infrared spectra of Baltic amber (succinite) can easily be identified through the so-called 'Baltic shoulder' in the region of 1150–12101/cm wavenumbers. No other fossil resin shows this characteristic absorption.[5]

As visible in Fig. 2, the spectra of the intact, non-corroded bead material of Punta di Zambrone is identical with succinite (Baltic amber). One can also see in Fig. 1 that the outer, corroded zone of the bead differs in its composition from the intact, non-corroded material. This is important for the method of analysing prehistoric amber: it is not possible to carry out 'non-destructive IR'-analysis on the corroded surface of archaeological amber artefacts.

[3] Beck 1986.

[4] The infrared spectroscopy was carried out by Dr. Detlev Hirschfelder, Landeskriminalamt Sachsen-Anhalt, Magdeburg. The author thanks him for his excellent cooperation.

[5] Beck 1986.

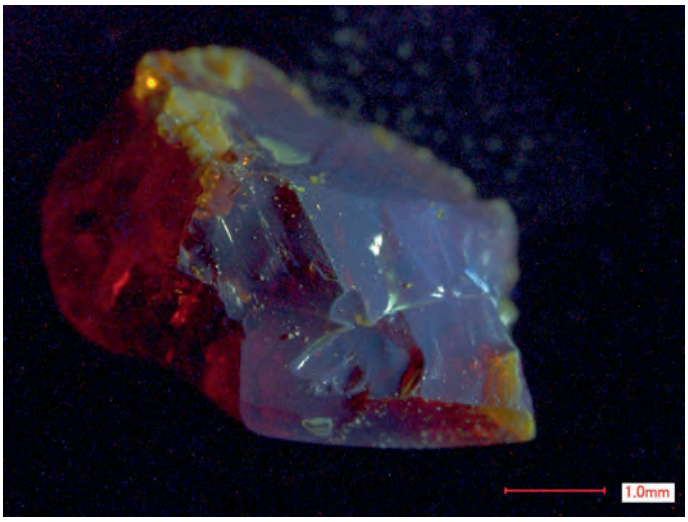


Fig. 3 The amber fragment from Punta di Zambrone (PZ66/P34, PZ66/P35) seen under ultraviolet light (365nm) (photo: Ch.-H. Wunderlich)

During corrosion processes in the soil, amber corrodes in nearly every case, losing water-soluble and/or evaporating volatile substances. The difference between non-corroded, modern (*post excavationem*) and broken archaeological amber can simply be detected in ultraviolet light. Fig. 3 shows the fragment of the amber bead under ultraviolet light (365nm). The modern, fresh broken parts show a pale blueish-turquoise fluorescence, while the corroded surface does not show any effect (It is also a simple method for finding hints of modern forgery or handling 'accidents').

Succinite is a fossil tree resin, which fossilised in geological times (about 40 million years ago) in the area of the recent Baltic Sea. It was transported by fluvial and glacial processes around the whole Baltic Sea, where it can still be found along the coast.

In addition, amber mining is still practised in the region of Yantarny (near Königsberg [Kaliningrad]), where it can be found embedded in so-called 'blue earth'.

Succinite does not occur in any other regions of the world, and in prehistoric times succinite could only be found on the coast of the Baltic Sea, because the modern amber mines of Bitterfeld did not exist and amber in this region is covered with a layer of glacial sediment of 70–100m in thickness. Prehistoric people did not have any way of reaching the amber of the Bitterfeld region.

The exact composition of succinite is not known, due to its high oligomeric constitution, nor do we know the exact botanical species of the amber-producing tree. While former researchers supposed that the resin came from a tree of the *pinus* family, Wolfe et al. suggested species from the conifer family *Sciadopityaceae* ('Umbrella pine').[6]

Although amber can be found in Sicily, the idea that the amber beads from Punta di Zambrone were made of local material can be excluded. The Sicilian amber is a fossil resin called 'simetite', which does not show the Baltic shoulder in its infrared spectra.[7] The amber of Punta di Zambrone must have been imported from the Baltic Sea coast, following the European amber trade route to Calabria.

6 Wolfe et al. 2009.

7 Murillo Borroso – Martinón-Torres 2012, 192, fig. 3.

Bibliography

Beck 1986
C. Beck, Spectroscopic investigations of amber, Applied Spectroscopy Reviews 22, 1, 1986, 57–110.

Murillo Borroso – Martinón-Torres 2012
M. Murillo-Borroso – M. Martinón-Torres, Amber sources and trade in the prehistory of the Iberian peninsula, European Journal of Archaeology 15, 2, 2012, 187–216.

Wolfe et al. 2009
A. Wolfe – R. Tappert – K. Mühlenbachs – M. Moudreau – R. C. McKellar – J. F. Basinger – A. Garret, A new proposal concerning the botanical origin of Baltic amber, Proceedings of the Royal Society B: Biological Sciences, 276, 2009, 3403–3412.