



Spectroscopic investigations of Palmnicken succinite: the legend of healing tears.

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¹ International Gemological Institute, Schupstraat 1, 2018 Antwerpen

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Amber is a fossil resin prized since ancient times for its distinctive beauty characteristics, widely used in the manufacture of jewellery and ornamentation. Its history is irretrievably tied to human culture: from the Etruscans through ancient Rome, along the Amber Road and Italic trade routes, to sun myths such as Phaethon and his sisters. We now understand that the chemical structure of amber depends significantly on the botanical source of the resin but this has not impaired its allure. This paper deals with Baltic amber, linked with butanedioic acid ($C_4H_6O_4$), or succinic acid (Beck, 1986). This natural compound, still found in certain flora, has been used for centuries in Europe as a natural medicine and antibiotic. From folk medicine—such as the tradition of giving babies amber beads during teething—to modern studies on the extraction of the substance (Matuszewska & John, 2004), Baltic amber remains suspended between ancient and modern science.

The aim of this study is to characterize succinite, a variety of Baltic amber containing 3% to 8% succinic acid. The analysed samples, originating from Palmnicken, the Lithuanian Baltic seashore, and ex-Prussia, occur as sub-rounded fragments of green to pale brown and dark reddish-brown color, raw and drilled. Standard methods were used in gemological examination to note color, hardness, refractive indices, ultraviolet fluorescence (long and short wave), and inclusions. A multi-technique approach was then used to further investigate the physical and chemical properties of the samples. X-ray powder diffraction was first used to rule out secondary phases. FTIR analyses confirmed the presence of succinic acid, showing not only the already described "Baltic shoulder" (Shashoua et al., 2006) but also a different distinctive feature of which it has been tried to deepen the meaning. Thermal analyses (TG and DTA) assessed the thermal degradation of the amber, with succinic acid degradation at around 400°C and total sample decomposition at temperatures above 700°C. Stable isotope analyses of C and N finally allowed the amber maturation and relative age to be characterized.

This multi-analytical approach suggests new knowledge about one of the most renowned ambers in jewellery, with more accurate tools for its identification and provenance tracing, i.e., the determination of its geographic origin, improving the knowledge of these ancient gemstones.

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Keywords: Baltic amber, succinite, fossilized resin, spectroscopy, provenance