

Identification of treated Baltic amber by FTIR and FT-Raman (a feasibility study)

Karolina Drąg ^{*1}, Maja Mroczkowska-Szerszeń ²,
Magdalena Dumańska-Słowik ³, Grażyna Żukowska ⁴

¹ *1 Faculty of Geology, University of Warsaw, 93 Żwirki i Wigury Str., 02-089 Warsaw, Poland*

² *Oil and Gas Institute–National Research Institute, 25 Lubicz Str., 31-503 Krakow, Poland*

³ *Faculty of Geology, Geophysics and Environmental Protection, AGH University of Science and Technology, 30 Mickiewicz Av., 30-059 Krakow, Poland*

⁴ *Faculty of Chemistry, Warsaw University of Technology, 3 Noakowskiego Str., 00-664 Warsaw, Poland*

*Corresponding author: ka.drag@uw.edu.pl

Keywords: Baltic amber, modified amber, natural resin, FTIR, FT-Raman

Heat-treated succinite modified under air, oxygen or inert gas atmosphere to improve its colour and clarity, was studied with Fourier-Transform Infrared and Raman spectroscopy, and referenced to variously altered untreated samples. For treated amber, the macroscopic observations revealed diagnostic features such as (1) the presence of discoidal “sun sparkles” inside the crumbs; (2) unusual colours (e.g. dark red) for transparent specimens; (3) mottled colour patches in “beeswax” and “dragon’s blood” amber; (4) luminescence quenching; and (5) significant reduction of pine-tree resinous smell. On FTIR spectra the heat treatment of succinite is mainly marked by: (1) the intensity decrease of 2932 cm⁻¹ band (>CH₂ and -CH₃), followed by the intensity increase of line at 1732 cm⁻¹; (2) the shifts of the band from ν(C=O) towards lower wavenumbers (from 1735 cm⁻¹ to 1714 cm⁻¹); (3) the decrease of intensity of the band at 888 cm⁻¹ (=CH₂ or -CH=CH-); (4) some slight distortion of “Baltic shoulder” in the region 1100-1300 cm⁻¹. The Principal Component Analysis applied to FTIR spectra enabled to distinguish not only untreated amber from treated one, but also recognize the modifications made under oxygen conditions from the ones in an inert gas. On RS spectra of the treated Baltic amber, the heat modifications are indicated by: (1) slight value increase of the relative intensity ratio I1650/1445 compared to untreated succinite; (2) the shift of bands near 1650 (C=C) and 1445 cm⁻¹ (CH₂, CH₃) towards higher wavenumbers.