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# Examination of the Baltic amber inclusion surface using SEM techniques and X-ray microanalysis

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ABSTRACT

Amber inclusion of the leafhopper, partly revealed from the resin and covered with inorganic, blackish and shining layer was examined using light and scanning electron microscopes. It is placed in the genus *Protodikraneura* of the recently described tribe Protodikraneurini (Insecta: Hemiptera: Cicadellidae: Typhlocybinae). SEM examination was conducted using microscope Hitachi S-3400N, equipped with X-ray EDS spectrometer of Thermo Noran Company, suitable for local chemical analyses. Part of the tegmen of the inclusion with details of its morphology is visible both in light and SEM microscopy. Its detailed structure and composition remained unidentified under light microscopy. Surface morphology and the chemical composition of the layer covering inclusion in particular, were studied in details using SEM microscope with the EDS X-ray spectrometer. The layer covering revealed portion of the inclusion presented various surface structures and various topographic features. The structure (grains of different shapes and sizes) is diversified in respect to their chemical composition. Qualitative and quantitative EDS analyses as well as the structure of grains building fragment of the layer were conducted. The surface of inclusion is partly covered with pyrite $FeS_2$, probably with one of the variations of the pyrite — the marcasite. Other portions of the surface layer differ in chemical composition and in physical structure of the grains, containing high amount of aluminum and silicon.



## 1. Introduction

The technique of the electron microscopy is the interdisciplinary technology widely applied in many disciplines of the science. At present, scanning electron microscopes (SEM) are basic measuring and research tools everywhere, where the need to analyze the state of the surface and the estimation of morphology occurs. The scanning electron microscope permits the observation and characterization of heterogeneous organic and inorganic materials on a nanometer (nm) to micrometer (μm) scale. The popularity of the SEM stems of its capability of obtaining 3-dimesional-like images of a wide range of materials (Goldstein et al., 2003). More often techniques of the electron microscopy and the X-ray microanalysis are used in the taxonomy examinations by palaeo-scientists, as well as X-ray microtomography techniques (Martínez-Delclós et al., 2004; Lak et al., 2008).

Amber and its inclusions have a very big cognitive value as well as in other fossil specimens — compression fossils, impressions in rocks, casts, etc. They allow the insight to ancient biocoenoses at the regional and global scale; they are used in evolutionary reconstructions, phylogenetics, biogeography, palaeoclimatology and palaeoecology, respectively.

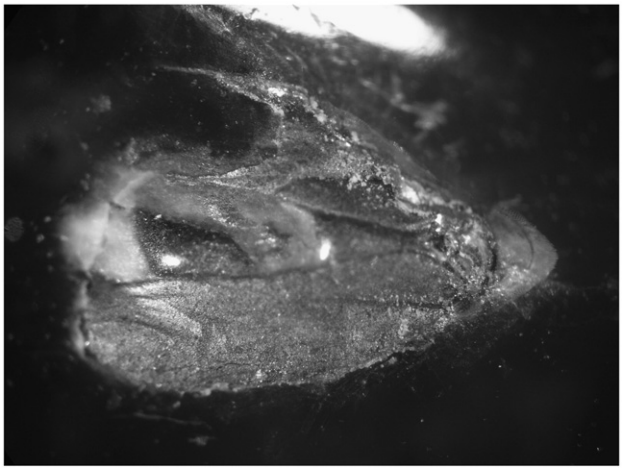

**Fig. 1.** Inclusion of *Protodikraneura* sp., light microphotograph.

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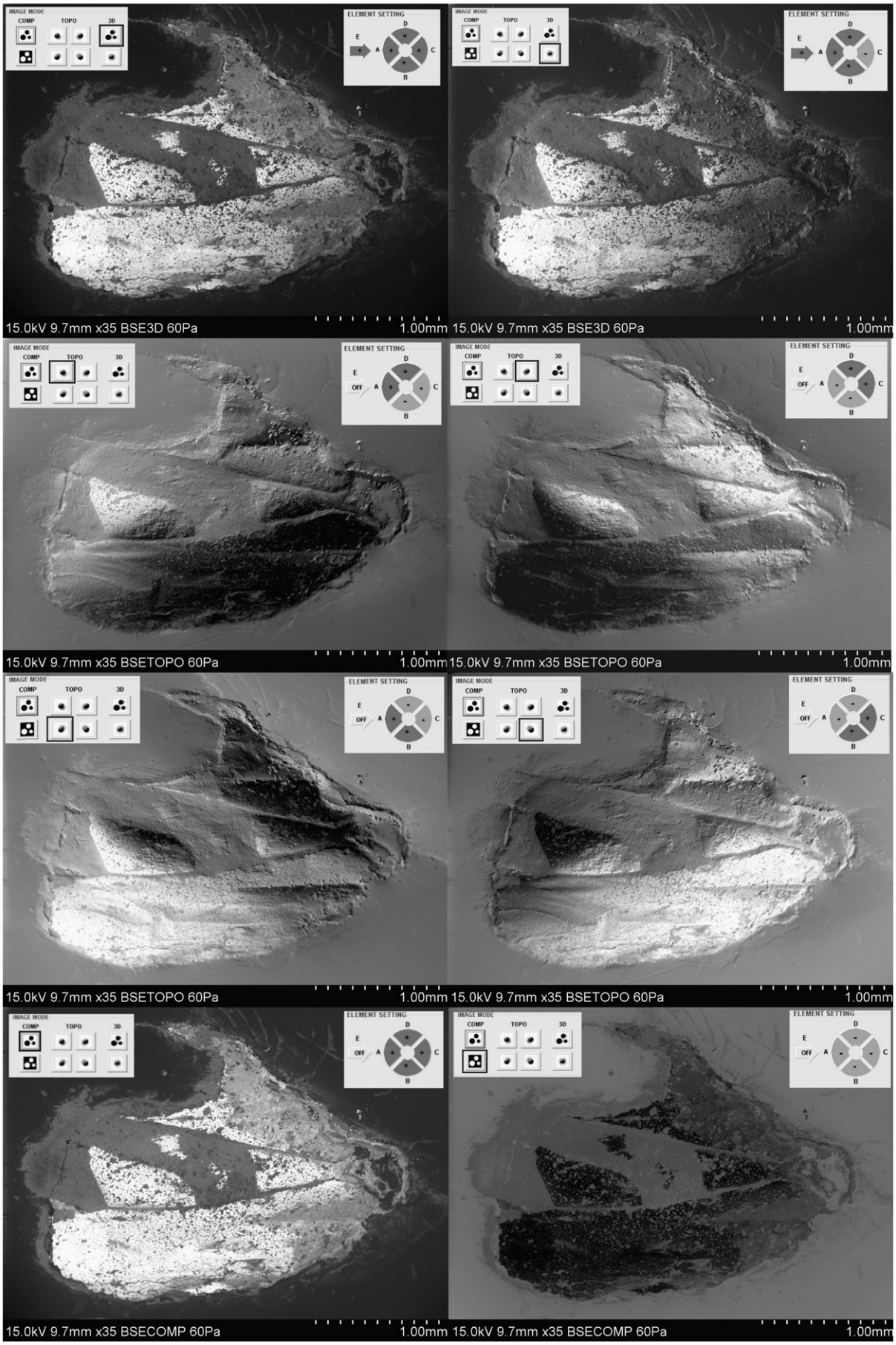


**Fig. 2.** Exposed area of the inclusion under SEM-BSE imaging.