19th International Conference on

Photoacoustic and Photothermal Phenomena.

July 16-20, 2017. **Bilbao**

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THERMO-OPTICAL PROPERTIES OF CUTICULAR STRUCTURES OF MORIMUS FUNEREUS (INSECTA: CERAMBYCIDAE)

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Recently, thermal imaging has become an important sensing technology in biological investigations [1]. Here we present a thermo-optical analysis of a longhorn beetle's exoskeleton (cuticle) in the visible and mid-infrared part of the spectrum. The insect (*Morimus funereus*, family Cerambycidae, shown in Fig. 1) possesses several prominent black patches on its hardened forewings (the elytrae). The patches, covered with dense, black, micron-sized hairs, were the subject of our investigation. Thermographic measurements were done by using a thermal camera, operating in the spectral range from 7.5 to 13 μm. We have found that deep black colour of the patches comes, not only from pigments (melanin), but from the underlying structure, and has a thermoregulatory effect [2]. Analysis has shown that these structures maximize absorption in a visible and minimize radiative thermal losses, thus enabling the insect to keep the heat. This particular property could be an inspiration for development of biomimetic coatings which will diminish thermal dissipation through radiation. This is in contrast to coatings inspired by an African desert ant, whose cuticle minimizes absorption in the visible and maximizes the radiative losses [3]. Principles discovered in both insects are well adjusted to different environments – a cold one, where it is important to keep heat, and a hot one, where it is necessary to dissipate thermal energy as efficiently as possible.

Figure 1. *Morimus funereus* (Mulsant, 1863)

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