ACTA PALAEONTOLOGICA POLONICA

Photography in the ultraviolet and visible violet spectra: Unravelling methods and applications in palaeontology

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Acta Palaeontologica Polonica 67 (3), 2022: 685-702 doi:https://doi.org/10.4202/app.00948.2021

We have tested different preparation and photographic methods to define a protocol for UV analysis of fossil specimens.We also have explored its main applications while analysing specimens from different stratigraphic contexts, of differentbiomineralogical composition, and belonging to different fossil groups (including invertebrates and vertebrates). Wehave photographed specimens using a camera equipped with appropriate lens and filters both in visible light and withflashlights at two wavelengths: the 365 nm UV light and the 440 nm visible violet spectrum, the latter here tested forthe first time. Our results indicate that bleach treatment is not recommended for calcite-shelled brachiopods, while it issuggested for aragonite-shelled molluscs. We show that photography in the ultraviolet and visible violet spectra are usefultools enhancing the recognition of morphological characters and colour patterns and allowing to distinguish soft-bodiedfossils from the matrix. Also, it allows to discern specimen areas embedded in the sediment from those exposed to sunlight,which is helpful to reconstruct the conditions experienced by fossils. However, the mineralogy of the biomineralaffects UV responses, as morphological characters of calcite shells are better emphasized with the 440 nm wavelength(visible violet spectrum), whereas those of aragonite, bioapatite and phosphatized specimens with the 365 nm (ultravioletspectrum); also, shell microstructures with their different crystal arrangement and elemental incorporation may causedifferent reactions, whereas the stratigraphic context affects specimen preservation influencing pigment preservation.We thus provide a protocol for photography in the ultraviolet and visible violet spectra and show that this techniquehas a high potential in palaeontology, having no limitations for its application in invertebrate or vertebrate specimens.

Key words: Biominerals, fossil specimens, shell colour pattern, UV photography, visible violet spectrum.

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