

Nannofossils used to determine the provenance of artworks

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Although nannofossils have been used previously for provenance analyses, mainly of gothic artworks, no systematic method has been developed for this application. The aim of the current provenance analysis was to establish the best method for determining the age and palaeobiogeographical position of rock materials that are used as base layers in paintings and in statues and to establish a reference materials database.

There are two main problems with artwork samples. The first is the difficulty in identifying nannofossils from extremely small samples that are man-made (natural rock material mixed with organic binders). Non-destructive methods might be preferred for this type of study (i.e. nano-CT scans and SEM), but not a lot of information can be obtained using these methods. Smear-slides still remain the best way for nannolith determination, but the standard methods for slide preparation have been shown to be ineffective for the isolation of nannofossils from aggregates of rock material containing binders. An extraction process was developed by empirical testing on a chalk and binder mixture made to resemble material from medieval base layers. The mixture was de-agglomerated at different temperatures, various ultrasonic times, and using eight chemicals, mainly micro-emulsions. The second problem is the availability of reference rock materials. We used two sources of materials – purchases from art shops (e.g. Rügen, Belgium and Champagne chalk) and samples taken from historical mining areas (e.g. the Sassuolo ceramic district). We plan to establish a database of nannofossils present in these materials, along with chemical and mineralogical data. These datasets will be published on a website that will be available to the scientific community.