



## Technical Approach

## Application of white cellulose acetate sheets on fossil wood investigation

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**Abstract**

Generally, transparent cellulose acetate sheets as a peel technique material are used in the identification of fossils, whereas white cellulose acetate sheets as a biochemistry technique material are applied in serum protein electrophoresis (SPE). Here we report the application of white cellulose acetate sheets for identifying a polished fossil wood from the Upper Mesozoic of West Liaoning, China. Based on the characters of transverse, radial, and tangential sections, the fossil wood is ascribed to a taxon of *Protoglyptostroboxylon* sp. Compared with transparent cellulose acetate sheets, white cellulose acetate sheets not only provide the similar information as that of the former, but also are more easily acquired in the Chinese market than the former. Because peel technique supported by white cellulose acetate sheets has the advantages of simple, time-saving, safe, reliable, and practical operation with lower material loss, it is a very good choice for the polished fossil wood investigation in labs, museums, geological parks, and handicraft shops. It is also a convenient approach to training students to learn the anatomic structure of fossil wood.

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**Keywords:** Fossil wood; Anatomic structure; Peel technique; Cellulose acetate sheet; Serum protein electrophoresis; *Protoglyptostroboxylon*

**1. Introduction**

Fossil wood is a useful proxy for reconstructing the paleovegetation and paleoenvironment in the geological history. In China, diverse and rich fossil wood taxa have been documented, ranging in age from Paleozoic to Cenozoic (Zheng et al., 2008). Recently, the fossil wood values are gradually recognized in public, more and more fossil woods are transported to the geological parks (Fig. 1), shown in the public and private museums or sold at handicraft shops. Most of the fossil specimens can be investigated by using standard method of cutting transverse, radial, and tangential sections (Zheng et al., 2008). How to identify fossil wood by a convenient method is one of the topics on fossil wood investigation.

Traditionally, this microsection technique is widely used in identifying petrified wood. But this technique is a complicated, unsafe, time-consuming, difficult to operate method with higher material loss. Until 1908, peel technique, first applied by Nathorst (1908) in studying the epidermal structure of fossil plants preserved as compression, is considered as a simple and quick method for preparing sections of permineralized plants, such as coal balls and fossil woods (Stieber, 1981; Taylor et al., 2009).

When the peel technique was first devised, preformed sheets of cellulose acetate were not available. In that time, a solution of paralodion, butyl acetate, amyl alcohol, xylene, castor oil, ether was poured on the surface of the section and allowed to dry. This resulted in peels that were not uniform in thickness and were sometimes difficult to mount on microscope slides. Another drawback is that the amount of time required for the poured peels to dry on the surface of specimens is too long (Taylor et al., 2009).

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12 cm

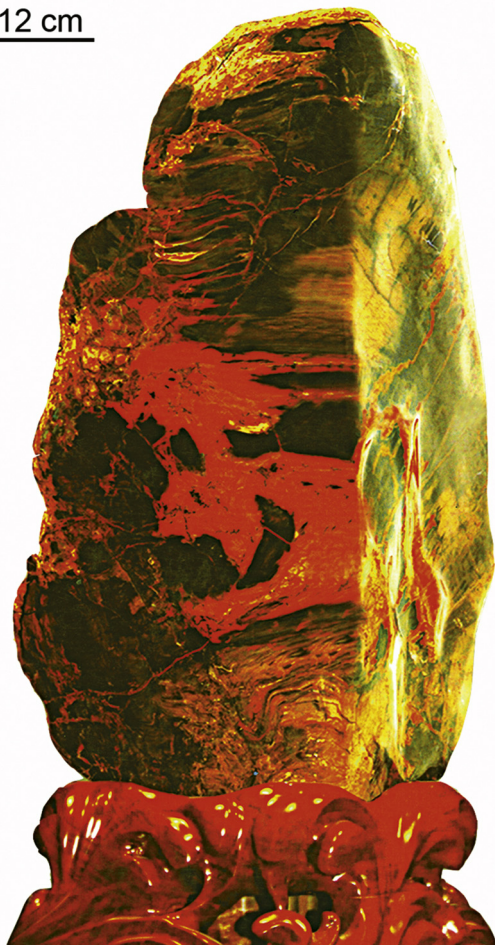


Fig. 1. The fossil wood “Red gold dragon”, one of the top four treasures in Chaoyang, stored in the Bird Fossil National Geological Park of Chaoyang, West Liaoning (Li et al., 2013).

In 1956, Joy et al. proposed a quick cellulose peel technique for preparing sections of permineralized plant specimens (Joy et al., 1956). Because preformed sheets of cellulose acetate are used in this technique, only 20 min is required for cellulose-acetate-sheet peels to dry. Lane (1962) also described an improved acetate peel technique, characterized by its easy application and good quality of produced peels.

Because traditionally preformed sheets of cellulose acetate used in peel technique are transparent cellulose acetate sheets, which are difficult to acquire in the Chinese market, we introduced white cellulose acetate sheets, which are originally used in serum protein electrophoresis (SPE), and easily obtained in the Chinese medical market, to study polished fossil wood. Compared with transparent cellulose acetate sheets, white cellulose acetate sheets not only provide the equally clear information as that of the former, but also are more easily obtained in the Chinese market than the former.

Because peel technique supported by white cellulose acetate sheets has the advantage of simple, time-saving, safe, reliable, and practical operation with lower material loss, it is a very good choice for the polished fossil wood identification in the labs, museums, geological parks, and handicraft shops. It is also



Fig. 2. The fossil wood and parts of the experiment equipment and reagents. The upper black arrow indicates acetone; the middle white arrow shows the polished fossil wood, collected from one of the handicraft shops in Chaoyang; registration number: PMOL-B01396; the lower black arrow indicates white cellulose acetate sheet named “Cellulose acetate layer sheet” with the product number 68003461.

convenient in training students to learn the anatomic structure of fossil wood.

## 2. Material and method

The present material is a polished cuboid silicified conifer wood (Fig. 2, middle white arrow; Fig. 3), with a size of 16.2 cm × 5.2 cm × 5.2 cm, collected from Chaoyang City of West Liaoning, China, designated to be corresponded to the Upper Mesozoic, i.e., Jurassic to Cretaceous. It belongs to silicified material based on following evidence: (1) It can be etched by the dilute hydrofluoric acid; (2) It cannot be engraved by knife; (3) It belongs to dense rock. This specimen gives us an opportunity to study it by a rapid peel technique supported by one kind of cellulose acetate sheets originally used in serum protein electrophoresis (SPE). The product of this cellulose acetate sheet named “Cellulose acetate layer sheet” with No. 68003461, is sold by Sinopharm Chemical Reagent Co., Ltd. The specimen is housed at the College of Paleontology, Shenyang Normal University.

The experiment procedure is as follows:

- (1) Flooding the surface of one section of fossil wood with acetone.
- (2) Putting the cellulose acetate sheet into position selected.
- (3) Removing the peel from the surface of fossil wood.
- (4) Putting the peel between a cover slip and a slide.
- (5) Checking the peel under the microscope BM2000 or XS-212 made by NJYO.

The above procedure is similar to that used in studying coal ball introduced by Taylor et al. (2009), excluding the first three steps, i.e., sectioning and polishing the material, etching each section of fossil wood in dilute hydrochloric acid (5%, 10 min). This is because our material is a polished silicified wood with clear transverse, radial, and tangential sections.

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