MINERALOGY OF PETRIFIED TREES IN THE PETRIFIED FOREST PARK, TAK PROVINCE, THAILAND

Associate Prof. Dr. Seriwat Saminpanya

Department of General Science, Faculty of Science, Srinakharinwirot University, 114 Sukhumvit 23, Watthana, Bangkok, 10110, Thailand

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Layout of presentation:

1) Introduction

2) Location, Materials, and Methods

3) Results

4) Summary of Results

5) Discussion and Interpretation
1) Introduction

- 7 petrified trees in the Petrified Forest Park, Tak Province in Northern Thailand were investigated in terms of mineralogy.

- The petrified tree No. 1 (BT1) is said to be the longest one in the world, (69 meters).

- The trees fell down and were buried in the Quaternary palaeoriver gravel beds at the depth <10 m.

- Later, the overburden was removed and now they are exposed to an open atmosphere.
Why do we study the minerals of petrified trees in this site?

The fossil woods have been deteriorating.
We need to know what kind of minerals in these fossils.
To perform the proper conservation means.
2) Location, Materials, and Methods

Google earth V 7.3.2.5491 (32-bit). (2/20/2017). Petrified Forest Park, Ban Tak District, Tak, Thailand. 17°03’44.43”N, 99°04’46.87”E, elev 163 m, Eye alt 2.16 km. https://www.google.com/earth/[October 28, 2018].
<table>
<thead>
<tr>
<th>Tree No.</th>
<th>Species</th>
<th>Length (m.)</th>
<th>Width (m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT1</td>
<td><em>Koompassioxylon elegans</em></td>
<td>72.2 (now 69)</td>
<td>1.8</td>
</tr>
<tr>
<td>BT2</td>
<td><em>Pahudioxylon cf. sahnii</em></td>
<td>31.3</td>
<td>0.5</td>
</tr>
<tr>
<td>BT3</td>
<td><em>Koompassioxylon elegans</em></td>
<td>32.4</td>
<td>2.1</td>
</tr>
<tr>
<td>BT4</td>
<td><em>Koompassioxylon elegans</em></td>
<td>44.2</td>
<td>1.4</td>
</tr>
<tr>
<td>BT5</td>
<td><em>Pahudioxylon cf. sahnii</em></td>
<td>22.2</td>
<td>1.2</td>
</tr>
<tr>
<td>BT6</td>
<td><em>Koompassioxylon elegans</em></td>
<td>34.5</td>
<td>1.55</td>
</tr>
<tr>
<td>BT7</td>
<td><em>Koompassioxylon elegans</em></td>
<td>38.7</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Ref: Songtham (2010).
Koompassioxylon elegans, “Thong-Berng”, currently found around the border of Thailand near Malaysia, and in Borneo and Indonesia.

Pahudioxylon cf. sahnii, “Ma-Ca-Mong”, currently found in the deciduous and dipterocarp forests in Thailand, Laos, Cambodia, and Vietnam.
Tree No. 1 (BT1), The longest, 69 meters.
Tree No. 6 (BT6)

Tree No. 7 (BT7)
Methods

Field works: observation, sample collection

- Polished section prep.
- Chip samples
- Powder of samples
- 2-3 Polished slabs
- Large 2 samples Ca. 10 cm.

• Petrography by Polarizing microscope: Mineralogy
• SEM-EDS: Morphology; Elemental composition (Qualitatively); Organism morphology
• XRD: ORIENTED AGGREGATE MOUNTS FOR X-RAY POWDER DIFFRACTION: Mineral species
• Raman microprobe: Mineral species
• Thermoluminescence, TL: Ages of petrifaction

Total 32 samples (3-5 samples from each tree)

Results, Discussion, and Interpretation
(Pace and Angyalossy, 2013)
3) Results
Quartz

Feldspar?

Illite

Kaolinite?
Hematite?

Raman

File: BT1-11-97_oriented.raw - Start: 5.061 ° - End: 70.050 ° - Step: 0.020 ° - Step time: 1. s
01-072-0469 (C) - Hematite - Fe2O3 - Hexagonal (Rh)
Ages by Thermoluminescence, TL

- BT6, age = 185,880±9,852 years
- BT7, age = 138,970±12,785 years

(Won-in et al., 2018)
1) Petrography and SEM →
- Quartz grains: Euhedral prismatic habit and granular habit.
- Chalcedony in some samples (a spherulitic texture of fibrous quartz grains radiating from the vessel).
- The wood structures can be overgrown by the quartz.
- The weathered woods → show spongy appearance.
- Microorganism probably fungi is seen under the SEM.
- Fe-oxide compounds, red or reddish brown stains in other cells outside the vessels.
- Some samples → contortion cells, suggesting that the wood was subjected to a pressure after the deposition.

2) SEM-EDS:
- O, Si, and Al → major elements
- Fe, K, Ca, Ti → trace elements

3) XRD and Raman → Quartz, illite, hematite?, kaolinite?, and feldspar?.

4) TL ages ~130,000-180,000 years BP.
5) Discussion and Interpretation

1) Silica solution penetrated to the wood structure then quartz crystallized.

2) The outer part of the vessel’s cell wall has a larger area and higher resistant from the weathering than those of other cells. This provides a suitable area for prismatic quartz grains to grow in the divergent habit.

3) Other cells (e.g. ray, fiber, parenchyma), having their smaller structures which are perforated by the solution, and then they were overgrown by irregular/granular quartz grains.

4) The turbid inclusions seen in the grains are the impurities which their composition is not the same as the quartz (SiO$_2$) and they are still not identified at this stage.
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9) Staff of the Gem and Jewelry Institute of Thailand (GIT) for XRD analyses.
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Thank you for your attention.