

Amber from the Thanbaya Gaing Coal Mine, Minbu Township, Magwe Region, Myanmar

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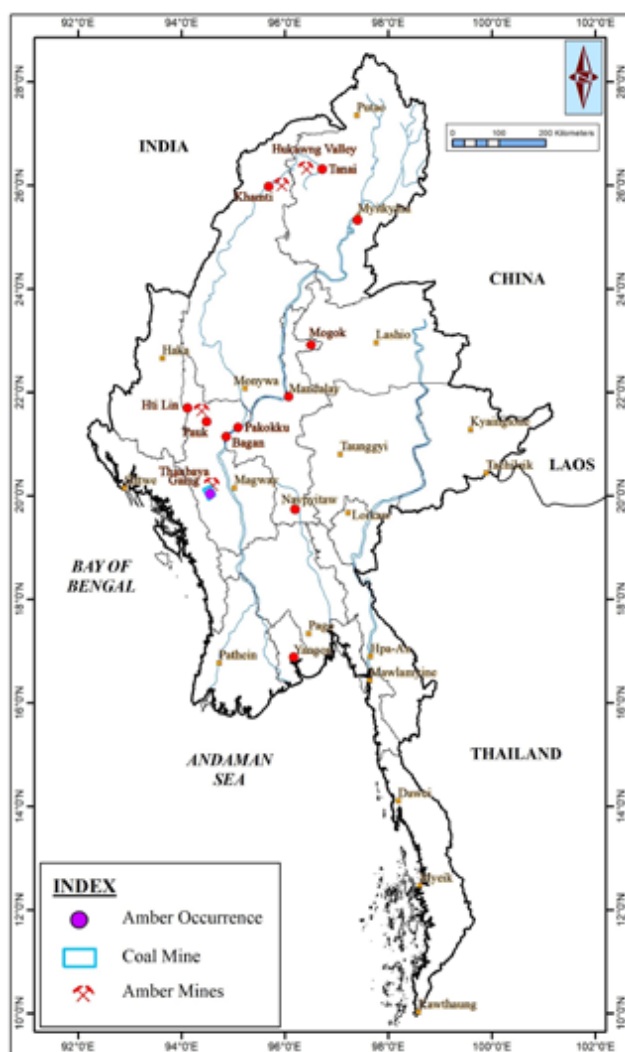


Figure 1: The location of the amber occurrences in Myanmar and the new occurrence of the amber at the coal field around the Thanbaya Gaing Coal mine, Magwe Region (Modified by Thet Tin Nyunt).

Amber was recently discovered by local coal miners at the Thanbaya Gaing Coal mine located 6.5 km northwest of Padaung village, and about 5 km west of Thanbaya Gaing village, Lat 20° 02' 54.8" Long 94° 33' 33.5" (Figure 1). The rock unit that is exposed in the study area is the Pondaung Formation (Late Eocene; Bender, 1983/Late Middle Eocene; Khin Zaw *et al.*, 2014) which includes sandstone, sandy mudstone and shaly mudstone where the carbonaceous mudstone and the surrounding coal seams are exposed (Myint Myat Chan Aye, 2024). The amber occurs as a small band with 1 to 3 cm in thickness and 2 to 4 cm length and is also found as a lentoid and lenticular shape near the coal seams such as bituminous coal, brown coal and dull coal (Figure 2 a, b).

Materials and results

For the study of the samples, basic gemmological methods such as Gem-A refractometer, GIA binocular microscope, Mettler H800C for hydrostatic measurement, Mineralite Lamp Model UVSL-25 ultraviolet light, and JASCO FT/IR-4X were used.

The parcel of amber ranges in colour from yellow, yellowish-brown to very dark brown and almost all are black. Most of the samples are opaque and only a few are translucent useable for the observation of inclusions (Figure 3). The size of the samples ranges from 1 cm to 10 cm in length.

The gemmological properties of the amber are as follows: RI 1.54 to 1.55 and SG 1.01 to 1.04. Under magnification flow marks, gas bubbles, white minute specks of carbonate attached on the surface and some unidentified inclusions (probably organic debris) were found, but no insects were found (Figure 4 a to f).

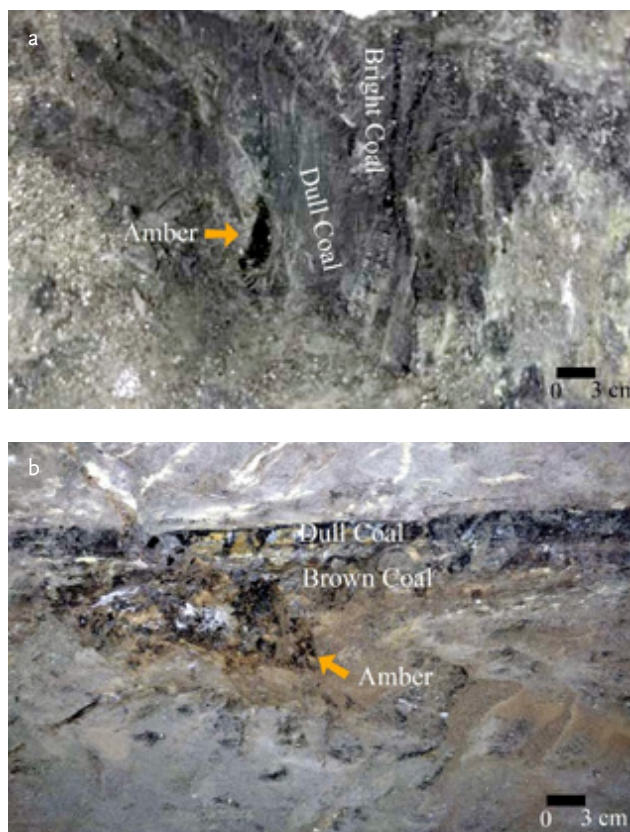


Figure 2 (a) Nature and occurrence of amber near the carbonaceous mudstone and the surrounding coal seams; (b) Lentoid and lenticular shaped amber near the coal seams (Photo by Soe Lwin).



Figure 3. Almost all the amber samples are black, other colours range from yellow to yellowish-brown and dark brown. The largest piece on the left weighs 28 grams (measure 6.5cm x 3.8cm) (Photo by Tay).

Under LWUV lighting, some of the sample fluoresce strong chalky blue in flow pattern with minute chalky blue droplets (Figure 5 a to d). Furthermore, when the long wave ultraviolet were switched off during the experiment, a dull greyish green appearance of the phosphorescence effect could be observed.

The FTIR analysis reveals spectral characteristics of amber, such as a broad O—H stretching peak at 3397 cm^{-1} and C—H stretching peaks at 2956 cm^{-1} and 2869 cm^{-1} (Garcia-Valles *et al.*, 2023) (Figure 6). Other similar peaks with amber include C=O stretching at 1708 cm^{-1} , together with C—H bending at 1378 cm^{-1} and C—O stretching at 1042 cm^{-1} (Garcia-Valles *et al.*, 2023), albeit minor shifts in wavenumber. Nearly all the samples have the presence of the C=C exocyclic methylene out of plane bending at 888 cm^{-1} , indicating unsaturated C=C structures. This shows that the Magwe amber had undergone the process of polymerization, i.e. maturation stages of amber from copal (Guiliano *et al.*, 2007; Zheng *et al.*, 2021). An interesting observation is that the presence of the peak at 2725 cm^{-1} is consistent in the Magwe amber samples, which is commonly identified as C—H stretch in aldehydes (Poinar & Mastalerz, 2000).

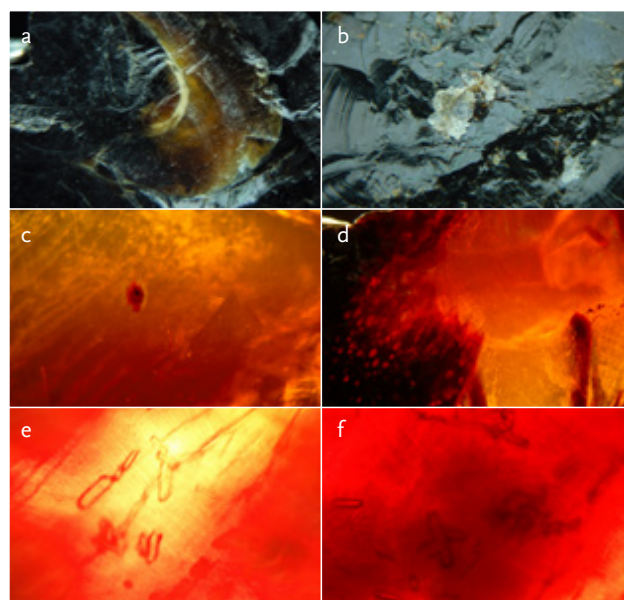


Figure 4. (a) Creamy white flow mark (10x); (b) white flaky carbonate mineral attached to the surface (10x); (c) minute organic debris (x40); (d) gas bubbles on the left side (20x) (Photomicrograph by Tay); (e-f) minute crystal inclusions in amber (x40) (Photomicrograph by Thet Tin Nyunt).

Conclusion

This study has highlighted that the dark brown ancient resin is amber, but the infrared spectroscopy showed the presence of C=C exocyclic methylene out of plane bending at 888 cm⁻¹ indicates unsaturated C=C structure i.e. copal. The Magwe amber indicates a transitional process of polymerization into

a purer form of amber. Unique observation of Magwe amber shows a strong bluish fluorescence in zoning and droplet, and on top of that, its phosphorescence in dull greyish-green when ultraviolet light was switched off. As this is the initial stage of study, more samples are needed to provide more data of Magwe amber.

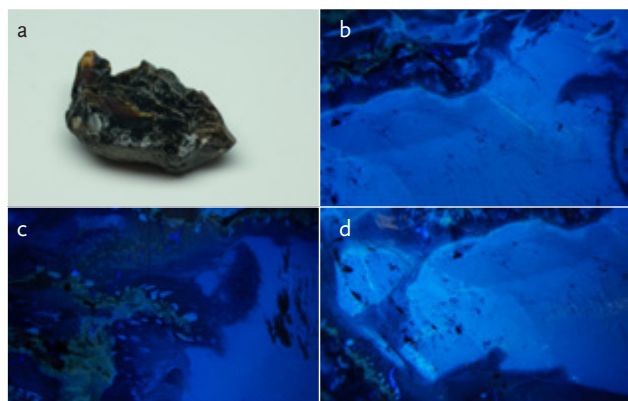


Figure 5. (a) Sample 14 showed opaque and dark yellowish-brown in colour amber (b) under LWUV, zoning fluorescence pattern; (c) bright chalky blue droplet and flow fluorescence; (d) patches of chalky blue fluorescence (10x) (Photo by Tay).

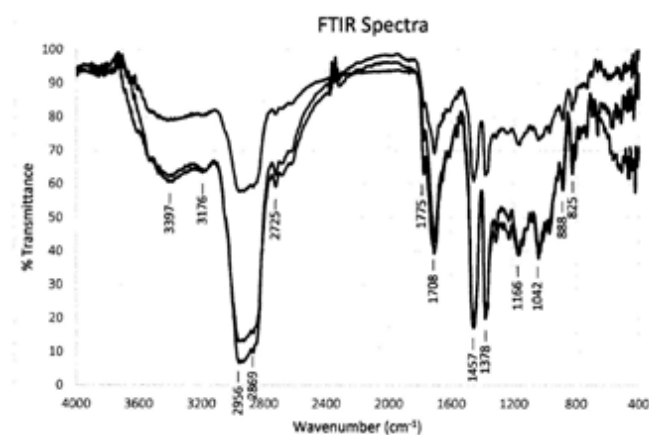


Figure 6. Representative infrared spectrum of amber from Thanbaya Gaing Coal mine, Magwe Region.

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Acknowledgements

The co-author TTS like to thank Mr Murali Krishnaswamy, Dr Guanghai Shi, Dr Linda Sellou and Ms