A study of absorption spectrum of the local product of amber (Payin) in Kachin State

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Abstract

The purpose of this research paper was to study the absorption spectrum and the nature of Amber (Payin). The determination of visible absorption spectrum on Amber was studied using UV–vis spectroscopy. Different amber absorbed different wavelengths of light. The wavelengths of light for UV–visible absorption were from about 200 nanometers to 800 nanometers. Absorption of light starts with energy of a certain wavelength in this UV–visible region being exposed to a molecule. The outcome of this had been measured by a UV–visible spectrophotometer. The data was shown as a spectrum with absorption versus wavelength. This pattern could be used to learn properties of the molecule. Only certain molecules could absorb light in this region. The local products of Ambers were studied in Kachin State.

Keywords: **amber,** UV–vis spectroscopy, fossilized tree resin, healing agent in folk medicine,

1. Introduction

Amber is fossilized tree resin (not sap), which has been appreciated for its color and natural beauty since No elithic times. Much valued from antiquity to the present as a gemstone, amber is made into a variety of decorative objects. Amber is used as an ingredient in perfumes, as a healing agent in folk medicine, and as jewelry.

There are five classes of amber, defined on the basis of their chemical constituents. Because it originates as a soft, stickly tree resin, amber sometimes contains animal and plant material as inclusions. Amber occurring in coal seams is also called resinite, and the term ambrite is applied to that found specifically within New Zealand coal seams.

Brown diamonds are of great interest at present because they are becoming more popular as gemstones, and also because they are used as raw material for high–pressure high–temperature (HPHT) treatment to obtain near–colourless diamonds or various colours of diamond deemed more attractive. Despite this they have not been studied extensively in comparison with near–colourless diamonds or other coloured diamonds

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such as yellow. We report here a study of centres found in one category of brown diamonds electron spin resonance (ESR).

2. History and Names

The English word *amber* is derived from Arabic *anbar*, Middle Latin *ambar* and Middle French *amber*. The word was adopted in Middle English in the 14^{th} century as referring to what is now known as *ambergris* (*amber gris* or "grey amber"), a solid waxy substance derived from the sperm whale. In the Romance languages, the sense of the word had come to be extended to Baltic amber (fossil resin) from as early as the late 13^{th} century. At first it was called white or yellow amber (*amber jaune*), and this meaning was adopted in English by the early 15^{th} century. As the use of ambergris waned, this became the main sense of the word. Ambergris is less dense than water and floats, whereas amber is less dense than stone, but too dense to float.

Amber was discussed by Theophrastus in the 4^{th} century BC, and again by Pytheas (c.330 BC) whose work "On the Ocean" was lost, but was referenced by Pliny the Elder, according to whose The *Natural History* (in what is also the earliest known mention of the name *Germania*). "Amber is produced from a marrow discharged by trees belonging to the pine genus, like gum from the cherry, and resin from the ordinary pine. It is a liquid at first, which issues forth in considerable quantities, and is gradually hardened 'succinum' ignited, with the odour and appearance of torch–pine wood" amber is also found in Egypt and in India, and the electrostatic properties of amber.

2.1 Physical Properties of Amber

A mineral is a naturally occurring homogeneous solid with a definite chemical composition and ordered crystalline structure. It is usually of an inorganic origin. **Amber is not a mineral**, because it has an organic origin and amorphous structure (no orderly internal arrangement of atoms). Information is available in a young resinous material, that is often times confused with amber, called copal. Copal resembles amber but is not a mineral either. Its composition can vary greatly depending on the botanical source, though all have terpenes or compounds linked as the resin matures. It is thought that Baltic amber, or succinite, contains 3–8% succinic acid (succus is Latin for juice); succinic acid is believed to form from microorganism–induced fermentation of the cellulose contained in the resin. One composition of an amber variety is: oxygenated hydrocarbon (carbon 67–87%, hydrogen 8.5–11%, oxygen 15%, sulfur 0–0.46%). Its color varies shades of yellow, orange, red, white, brown, green, bluish, "black" (deep shades of other colors). Rainbow colors within the amber are caused by the light interference of air bubbles or strain created during an insect's death struggle. Some believe that the color is related to the type of tree source. Recent pine trees produce golden yellows, white, ivory–colors, and occasionally a blue resin. Scientists at the Polish Museum of Science believe that reddish tints are the resin of deciduous trees, such as cherry and plum. Dominican amber with a reddish tint is thought to be related to a leguminous source.

Amber color preferences are different from country to country. The transparent reds and greens are thought to be the most desirable colors in some countries, followed by the transparent yellows. The warm, transparent, orange color seems to be a desirable color for many Americans. Natural amber, regardless of color, may darken to a mellow brown after long exposure to air; pressed amber may turn white as it ages. Its transparency has all graduations from perfectly clear to wholly opaque, with cloudy turbidity due to the presence of numerous air bubbles and inclusions. The air in amber is bubbles, amber, and dinosaurs by Gary Landis and Dinosaur breath by John G. Cramer. Amber from Myanmar, is the hardest at 3 on the hardness scale; Baltic amber is usually in the range of 2–2.5; Dominican amber is the softest at 1–2. Geologically younger ambers are softer than amber that has been buried for a long time. Some pieces show fluorescence. The common fluorescent colors of amber are blue or yellow, and less frequently a green, orange, or white. In general, resins have higher sulfur content fluoresce more than those containing less sulfur.

2.2 Ultraviolet–Visible Spectrophotometer

The instrument used in ultraviolet visible spectroscopy is called a UV/Vis spectrophotometer. It measures the intensity of light passing through a sample (I), and compares it to the intensity of light before it passes through the sample (I_o). The ratio I/I_o is called the *transmittance*, and is usually expressed as a percentage (%T). The absorbance is based on the transmittance.

$$A = -\log(\%T/100\%)$$

The UV–Visible spectrophotometer can also be configured to measure reflectance. In this case, the spectrophotometer measures the intensity of light reflected from a sample (I), and compares it to the intensity of light reflected from a reference material (I_o) (such as a white tile). The ratio I/I_o is called the *reflectance*, and is usually expressed as a percentage (%R). The basic parts of a spectrophotometer are a light source, a holder for the sample, a diffraction grating in monochromator or a prism to separate the different wavelengths of light, and a detector. Samples for UV/Vis spectrophotometry are most often liquids, although the absorbance of gases and even of solids can also be measured. UV–Visible microspectrophotometers consist of a UV–Visible microscope integrated with a UV–Visible spectrophotometer and it is shown in Fig.1 and Fig.2. A complete spectrum of the absorption at all wavelengths of interest can often be produced directly by a more sophisticated spectrophotometer. In simpler instruments, the absorption is determined one wavelength at a time and then compiled into a spectrum by the operator. By removing the concentration dependence, the extinction coefficient (ε) can be determined as a function of wavelength.

Fig.1 Schematic diagram of UV–Visible Spectrophotometer

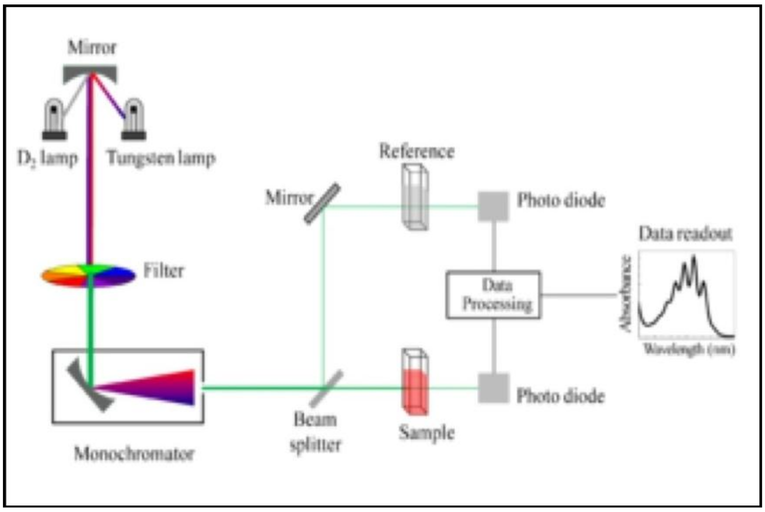

Fig.2 Beckman DU640 UV/Vis Spectrophotometer

2. Results and Discussion

Ultraviolet luminescence is determined under darkroom conditions, with the sample placed against a non–fluorescent black background. Geological microscope is used with a variety of illumination techniques, including dark–field, transmitted light, polarized light, and oblique illuminations. The ultraviolet and visible absorption spectra are obtained using a dispersive Cary 5G Varian spectrophotometer. The spectra are recorded in the range 250–850 nm, with a spectral band width of 1 nm and a sampling of 1 nm for a slow scan speed of 15 nm/ min. The colours are observed range from light brown to a very dark brown (which appears black when seen under normal lighting conditions). The absorption of a molecule can be used to determine the concentration of the molecule in. To find concentration , Beer’s law is used. A mathematical relationship is shown by the equation below.

$$a = \frac{A(L)}{cb(mol\ cm)} = L\ mol^{-1}cm^{-1}$$

A = absorption, a = absorptivity coefficient, b = pathlength, c = concentration

The components of Beer's Law are can be determined by tests. They can also be referenced in literature. If the absorption is measured by UV–visible spectrophotometer (instrument to measure absorption and wavelength of molecules), pathlength (b) is related to the sample container used in the test. The sample container (named a cuvette) is made of a material that does not absorb light in this region. The thickness of this cuvette is a known value. This is the pathlength the light that will travel through to reach the sample. The molar absorptivity coefficient can be calculated by measuring the absorption of a sample of a known concentration and known path length. The absorptivity coefficient units are dependent on the path length and concentration units. Molar absorptivity units are L mol^{-1} cm^{-1} when the concentration units are molarity. The absorpivity is a measure of how strongly a molecule absorbs light at a particular wavelength. Once this constant is determined, unknown concentrations can be determined from this relationship. Fig.3 shows the photograph of light brown amber and its infrared absorption spectrum in Fig.4. For brown amber,the photograph of amber shows in Fig.5and its absorption in Fig.6.And then, Fig.7 shows for dark brown amber an also its absorption in Fig.8. The photograph of comparison of three types of amber is shown in Fig.9. They were studied at room temperature and the absorption of them was determined according to the compared graph in Fig.10.

Fig. 3 The photograph of light brown amber

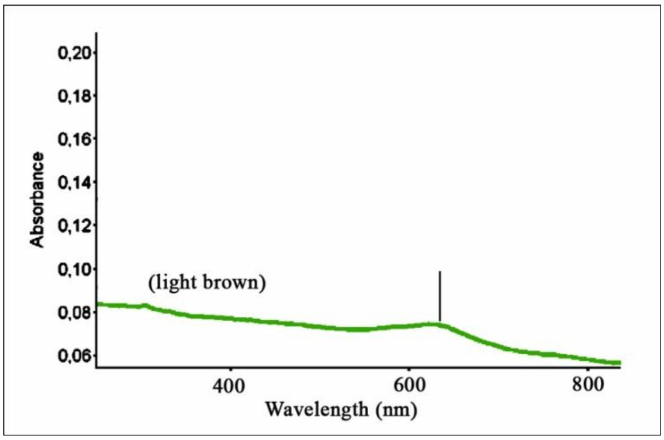

Fig. 4 Infrared absorption spectra at room temperature for light brown

Fig. 5 The photograph of brown amber

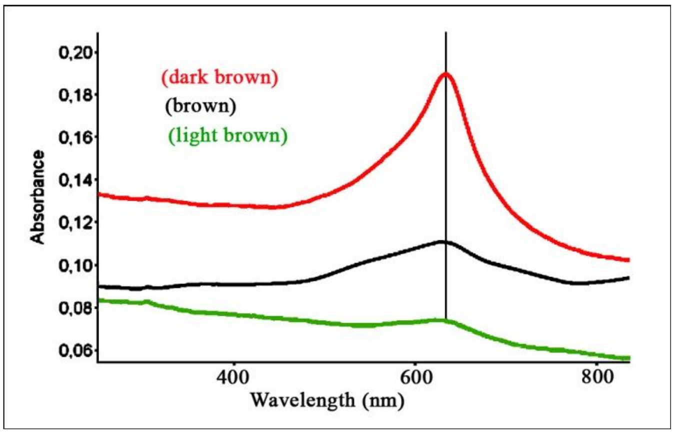

Fig. 6 Infared absorption spectra at room temperature for brown

Fig. 7 The photograph of dark brown amber

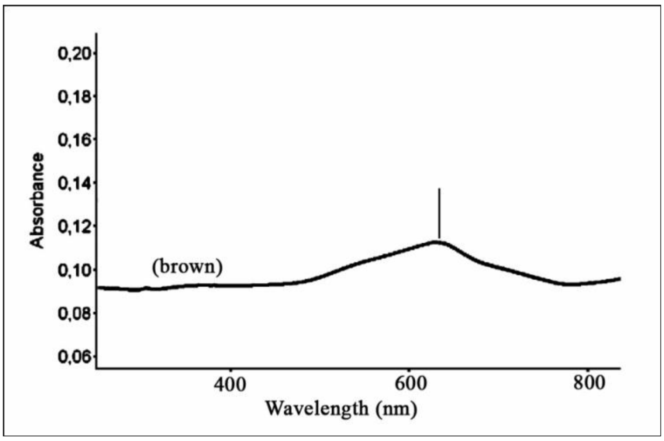

Fig. 8 Infared absorption spectra at room temperature for dark brown

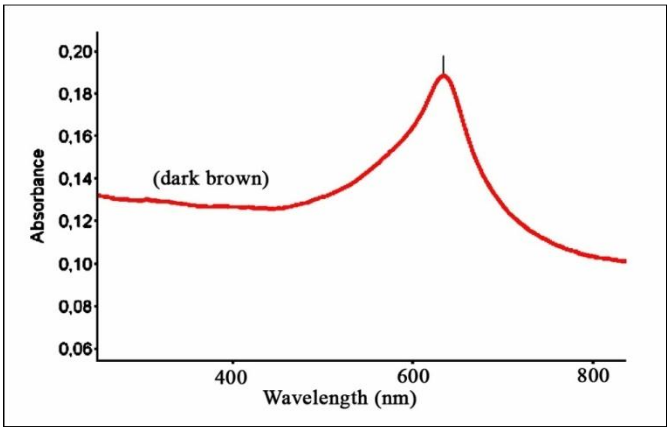

Fig. 9 The photo graph of Amber

Fig. 10 Infared absorption spectra at room temperature for three brown amber

3. Conclusion

We have taken three diamonds, colour–graded as light brown, brown, and dark brown, which all had a similar concentration and the amber absorption inceases with the depth of brown colour. These spectra show that the amber absorption is more intense in amber with a dark brown colour. The length of the optical path is about the same in these three diamonds using the intrinsic absorption bands. The dark brown colour amber is most absorption spectrum. We learn about amber mosquito Kachin. Amber is not gems but its jewelry has been found, made from beautiful Amber stone. It is common to find these ideas from the past replicated in Amber jewelry sold these days, as many beautiful pieces are made with similar designs. Genuine Amber jewelry is easy to buy and these pieces are excellent to aid healing in a number of ways, as well as beneficial to aid you to manifest money.

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