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Materiality of Natural Colour: A Studio-Based Exploration of Sappan Wood and River Stone

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Abstract

This study examines the transformation of sappan wood (*Caesalpinia sappan*) and river stone collected from Sungai Sedim, Kedah, and Sungai Siputeh, Selama, Perak, into natural pigments through studio-based art practice. Informed by materiality, the study explores how material properties emerge through preparation, handling and application, and how these responses shape artistic decisions. A qualitative studio-based approach involved extracting colour from sappan wood, forming pigments using alum with sodium carbonate or calcium carbonate, and preparing river stone pigment through grinding and sieving. Both pigments were mixed with binder for painting applications. Sodium carbonate treatment produced a stronger sappan wood colour than calcium carbonate treatment, although this difference became less noticeable after drying. Sappan wood pigment showed smooth, watercolour-like handling on paper but was harder to control on canvas, prompting adjustments in water and brushwork. River stone pigment remained slightly granular despite repeated grinding and sieving. These findings indicate that natural colour is understood not only through its final hue, but also through material transformation and the artist's responses during making. The study highlights studio practice as a way of developing material knowledge for contemporary art.

Keywords: Natural Colour, Materiality, Sappan Wood, River Stone, Natural Pigment, Studio Practice

Introduction

This study explores natural colour through studio-based practice by examining how sappan wood and river stone are transformed into usable artistic colour materials. Rather than focusing only on hue, the study considers the physical processes through which each material is prepared, handled and applied. Sappan wood releases colour through extraction, while river stone becomes pigment through crushing, grinding and reduction into fine particles. These contrasting processes provide a basis for examining how different material properties shape studio experience and artistic decision-making (Gueli et al., 2017; Taif et al., 2019)

Studio practice is approached in this study as a form of artistic enquiry through making, experimentation, observation and reflection(Barrett & Bolt, 2010; Sullivan, 2010). Practice-led research also demonstrates how direct engagement with materials can inform artistic and aesthetic decisions(Nimkulrat, 2010) . This approach is closely connected to materiality, particularly (Ingold, 2007). perspective on understanding material properties through transformation and making. Rather than treating natural colour solely as a finished hue, this study examines how materials respond to extraction, grinding, binder preparation and application on different surfaces. Through these interactions, qualities such as texture, consistency and surface response become part of the artist's experience and decision-making.

Natural colour has been widely examined in relation to historical use, extraction and processing methods, textile dyeing, sustainability and technical colour performance(Uddin et al., 2022; Yusuf et al., 2017) These studies provide important knowledge about natural colourants, but there remains room to examine more closely how different natural materials influence the artist through the physical processes required to transform them into artistic media. A plant-based colour and a stone-based pigment may both be described as natural colour, yet their pathways towards colour involve different forms of transformation, resistance and material interaction.

Accordingly, this study examines how sappan wood and river stone are transformed into natural colour materials through studio-based practice and how their different material characteristics influence artistic application. The study focuses on the transformation of an organic plant source and a geological source into usable pigments, with particular attention to material behaviour, handling, surface interaction and artistic decision-making.

Natural Colour as Studio Material

Natural colour can be understood not only through its hue but also through the physical qualities that emerge during preparation and application. Within studio practice, these include texture, particle size, consistency, transparency and surface response. Previous studies have demonstrated that pigment particle size and binder composition can influence colour appearance and surface properties (Gueli et al., 2017; Pozo-Antonio et al., 2018). These qualities may change as natural materials are transformed into pigments and workable painting media.

Approaching natural colour as a studio material shifts attention from the final colour towards the processes of preparation, testing and application. A liquid extract may behave differently after drying, while dry pigment may change in handling when mixed with binder or applied to paper and canvas. Through repeated observation and adjustment, the artist develops material knowledge that informs subsequent artistic decisions (Sullivan, 2010).

Sappan Wood as Organic Colour Material

Sappan wood (Caesalpinia sappan), locally known as kayu sepang, is a plant-derived colour source that releases reddish colour into water during heating. In this study, its transformation from solid wood into liquid colour extract formed the initial stage of pigment preparation. Water-based extraction of sappan wood has also been documented in natural dye research (Taif et al., 2019).



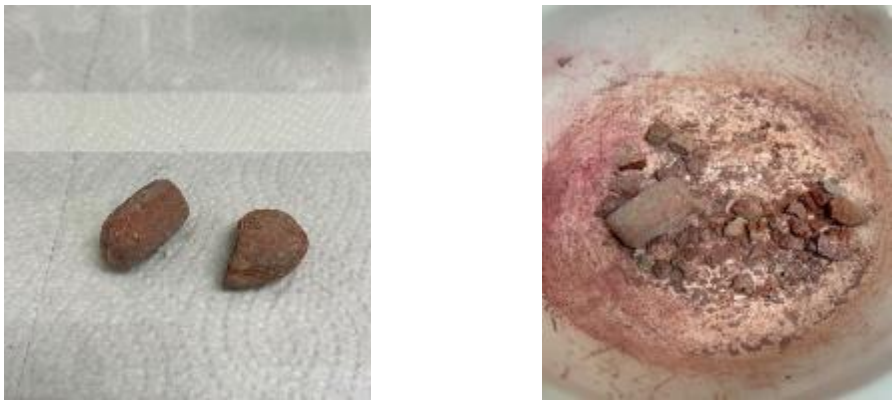
(a) **(b)**

Figure 1. Sappan wood in its raw form (a) and during the colour extraction process (b).

Following extraction, the colour extract was filtered and processed to form pigment sediment. Previous research has demonstrated that sappan wood colourants can be converted into insoluble lake pigments through alum-assisted treatment under alkaline conditions (Girdthep et al., 2018). In this study, the collected pigment was dried, ground and mixed with binder to produce a workable painting medium. These transformations demonstrate how the material changes throughout preparation and artistic handling.

River Stone as Geological Colour Material

River stone provides a contrasting material pathway to sappan wood. Unlike plant-based colour that is released through extraction, the colour of river stone is obtained through the physical reduction of the geological material itself. The stone begins as a compact solid material with characteristics such as hardness, density, surface texture and resistance. Through fragmentation, crushing and grinding, the material is gradually reduced into smaller particles until it can function as a pigment.



(a) (b)

Figure 2. River stone in its raw form (a) and after fragmentation and grinding (b).

As the stone is progressively crushed and ground, its physical condition changes from a single geological object into fragments, grains and eventually pigment particles. Unlike sappan wood, where colour moves from the plant material into a liquid extract, river stone retains a direct physical continuity with its original source because the resulting pigment consists of particles from the stone itself. Differences in particle size may also influence the texture and visual character of the resulting pigment when mixed with binder and applied to a surface

(Inada, 2020). This transformation allows river stone to be examined not only as a source of colour but also through its resistance, grain and physical presence within studio practice.

Research Problem

Natural colour has been widely discussed in relation to historical use, extraction techniques, textile dyeing, sustainability and technical colour performance (Uddin et al., 2022; Yusuf et al., 2017). These studies provide important knowledge about the sources, preparation and performance of natural colourants. However, within the context of studio-based art practice, there remains room to examine how the physical transformation of different natural materials affects the process of making and the artist's response to the material.

A plant-based source such as sappan wood and a geological source such as river stone may both eventually function as natural pigments, yet the processes through which they become usable artistic materials are fundamentally different. Sappan wood requires extraction, filtration and pigment formation, while river stone requires fragmentation, crushing and grinding. When both are considered only according to their final colour, these differences in material process can be overlooked. This study therefore addresses the need to examine natural colour not only as a visual outcome, but as a relationship between material source, transformation, artistic action and surface interaction.

Scope of the Study

This study is limited to a studio-based investigation of two natural colour sources: sappan wood and selected river stone. The research focuses on observable material qualities that emerge during preparation, transformation and application, including colour, texture, consistency, particle behaviour, absorption, adhesion and surface interaction. Paper and canvas were selected as conventional painting supports commonly used in studio practice. Their differing surface characteristics provided an opportunity to observe how the prepared pigments responded during artistic application. The study is conducted through the practice of a single artist-researcher and is concerned primarily with how these material characteristics influence studio processes and artistic decision-making.

The study does not include advanced chemical analysis of sappan wood or mineralogical identification of the river stone. River stone is therefore discussed according to its visible and physical characteristics within studio practice unless its geological composition is independently confirmed. The emphasis remains on material engagement, observation and the knowledge generated through making rather than on laboratory-based analysis or industrial performance testing.

Objectives

The objectives of this study are to:

- Examine how sappan wood and river stone are transformed into usable natural pigments through studio-based practice.
- Investigate how their differing material characteristics influence handling, surface interaction, material response, and artistic decision-making during application.

Theoretical Framework: Materiality and Natural Colour

Materiality provides the main conceptual framework for this study. Rather than understanding materials as fixed substances with predetermined qualities, the framework directs attention to how their properties become apparent through processes of handling, transformation and interaction. (Ingold, 2007) argues that materials should be followed through the processes in which they change and respond. From this perspective, natural colour is not understood only as a finished hue, but as something that develops through the physical transformation of material during studio practice.

Within this study, materiality is examined through the different transformations of sappan wood and river stone. Sappan wood moves from solid wood into colour extract, pigment sediment, dry pigment and eventually a workable painting material. River stone follows a different pathway, moving from a solid geological object into fragments, particles, pigment powder and finally a paintable medium. Each stage reveals different material characteristics, including fluidity, sedimentation, resistance, grain, particle size and surface behaviour. These characteristics become known through direct engagement with the materials rather than through observation of the finished colour alone.

The relationship between artist and material is therefore understood as an ongoing process of action and response. The artist transforms the material through heating, filtering, crushing, grinding, mixing and application, while the physical response of the material influences what happens next. An unexpected change in colour, texture, consistency or surface behaviour may require the artist to adjust the process or may contribute to a new artistic decision. In this sense, studio practice becomes a way of generating material knowledge through making, observation and reflection (Carter, 2004; Sullivan, 2010). Materiality is therefore used in this study to understand how artistic outcomes develop through the interaction between material properties and artistic action.

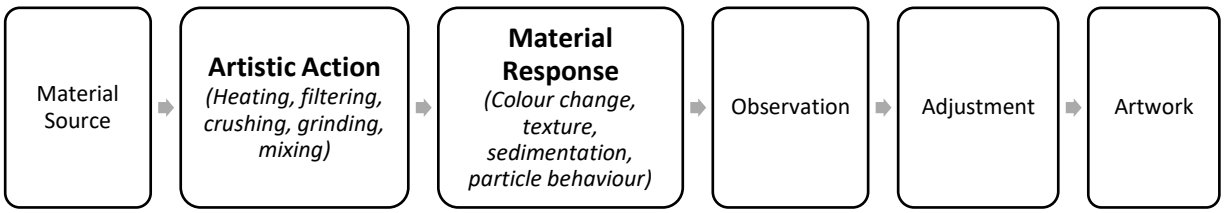


Figure 3. Material interaction within the studio process.

Methodology

Research Design

This study adopts a qualitative studio-based practice methodology. The studio functions as the main site of enquiry, where knowledge is developed through direct engagement with materials, experimentation, observation and reflection. This approach is appropriate because the study is concerned not only with the final colour produced, but also with how sappan wood and river stone behave throughout the processes of transformation and artistic application. In this sense, practice is treated as a form of research in which making becomes a way of generating knowledge (Sullivan, 2010).

The research is organised around four connected stages: preparation, transformation, application and reflection. Preparation involves selecting and handling the raw materials. Transformation refers to the processes through which sappan wood and river stone are converted into usable natural colour materials. Application focuses on the use of the prepared colour on selected surfaces, while reflection involves observing, recording and interpreting the material behaviour that emerges throughout the studio process. Through these stages, the study examines how material properties influence both the making process and artistic decision-making.

Materials and Studio Setting

The studio investigation focused on two selected natural colour sources: sappan wood and river stone. Sappan wood was selected as an organic plant-based material, while river stone was selected as a geological material. The river stone samples were collected from river environments in Sedim, Kedah, and Sungai Siputeh, Selama, Perak. The selection of these two materials allowed the study to examine contrasting material processes within the same studio-based investigation.



(a) (b)

Figure 4. River stone collection sites in Sungai Sedim (a), and Sungai Siputeh, Selama (b).

The materials were processed and tested within the studio through extraction, pigment preparation and artistic application. Sappan wood was processed through water-based extraction, while river stone was physically reduced through fragmentation and grinding. Mordants were used during the preparation of selected colour materials, including alum combined with sodium-based and calcium-based treatments. The prepared colour materials were subsequently tested through artistic applications on paper and canvas. A binder was used where necessary to convert the prepared pigment into a workable painting medium.

Sappan Wood: Extraction and Pigment Preparation

Sappan wood was prepared through a water-based extraction process to release its natural colour into a liquid medium. The raw material was combined with water and heated for approximately 45–60 minutes over medium heat, with the final 15–20 minutes conducted at low heat. The extract was then left to rest for approximately 15–30 minutes before filtration.

This process allowed the colour compounds within the wood to be released into the water, producing a coloured extract for further pigment preparation.

Following extraction, the liquid was filtered to separate the coloured solution from the remaining wood material. The filtered extract was then subjected to selected pigment-forming treatments. In this study, alum was used in combination with sodium-based and calcium-based treatments to investigate the formation and characteristics of the resulting pigment. The pigment material was subsequently separated from the liquid, dried and prepared for grinding before being converted into a workable painting material. The pigment-forming treatments and subsequent preparation stages are presented in Table 1 and Figure 5, respectively.

Table 1
Pigment-forming treatments applied to sappan wood colour extract

Treatment	Colour Extract (mL)	Alum (g)	Sodium Carbonate (g)	Calcium Carbonate (g)
Alum + Sodium Carbonate	500	3	1.5	–
Alum + Calcium Carbonate	500	3	–	1.5



(a) Pigment Precipitation (b) Filtration (c) Dried Pigment

Figure 5. Stages of sappan wood pigment preparation: (a) pigment precipitation, (b) filtration of pigment sediment, and (c) dried natural pigment.

The resulting pigment was mixed with a binder to allow its application onto selected studio surfaces. Throughout the process, observations were made on changes in colour, consistency, sedimentation, texture and handling. These observations were recorded as part of the studio investigation to understand how the material responded to each stage of transformation.

River Stone: Fragmentation and Pigment Preparation

River stone was prepared through a physical reduction process in which the solid material was progressively fragmented and ground into smaller particles. Unlike sappan wood, which releases colour through water-based extraction, the preparation of river stone depended on direct physical transformation of the material. The stone was first broken into smaller fragments before being ground into powder using a mortar and pestle. The ground material was then sieved to separate finer particles from coarser particles. The coarse particles retained in the sieve were ground again until a finer texture was achieved.

The grinding process produced changes in the physical character of the material, particularly in relation to particle size, texture and consistency. The resulting pigment was then prepared for artistic application by mixing it with a binder to form a workable painting medium. The material was subsequently tested on selected studio surfaces to observe its interaction with the surface and its behaviour during application. The stages of river stone pigment preparation are illustrated in Figure 6.



(a) (b) (c)

Figure 6. Stages of river stone pigment preparation: (a) crushing and grinding, (b) ground pigment particles, and (c) pigment mixed with binder.

Throughout the preparation and application process, attention was given to the material response of the stone pigment, including its texture, particle behaviour, adhesion, absorption and visual character. These observations were used to inform subsequent adjustments in the preparation and application of the material within the studio practice.

Artistic Application

The prepared natural pigments were subsequently applied within the studio to examine their behaviour on selected surfaces. Sappan wood pigment and river stone pigment were tested through artistic applications on paper and canvas. These applications allowed the materials to be observed beyond the pigment preparation stage and examined through their interaction with different surfaces and supports. Both pigments were mixed with the same water-based binder formulation, prepared using 38 mL of gum arabic, 2 mL of glycerin, 1 mL of honey, 3 mL of ox gall, and 1–3 drops of clove oil.

During application, attention was given to the consistency of the colour material, ease of handling, absorption, adhesion, texture and visual appearance on the selected surfaces. The interaction between pigment, binder and surface was observed as part of the studio process,

allowing adjustments to be made according to the response of the material. The application of both pigments on paper and canvas is presented in Figure 7.



(a) Sappan Wood (Paper)



(b) Sappan Wood (Canvas)



(c) River Stone (Paper)



(d) River Stone (Canvas)

Figure 7. Artistic application of natural pigments on different surfaces: (a) sappan wood pigment on paper, (b) sappan wood pigment on canvas, (c) river stone pigment on paper, and (d) river stone pigment on canvas.

The resulting applications were not treated only as colour samples, but also as part of the artistic investigation. The material responses observed during application informed subsequent decisions concerning layering, surface treatment, composition and the development of artworks. In this way, artistic application functioned as a stage through which material knowledge was further developed through direct studio experience.

Observation and Documentation

Observation and documentation were carried out throughout the studio process to record the material responses that emerged during preparation and application. Attention was given to changes in colour, texture, consistency, particle behaviour, absorption, adhesion and surface interaction. These observations provided a basis for comparing the different material characteristics of sappan wood and river stone.

The studio process was documented through photographs, process records and observations made during material preparation and artistic application. The documentation focused on the transformation of the materials from their original forms into usable natural colour materials and their subsequent application on selected surfaces.

The recorded observations were used to inform subsequent adjustments in the studio process and artistic decision-making. Rather than evaluating the materials only according to the final colour produced, the study considered the responses that occurred throughout the different stages of material transformation and application.

Findings and Discussion

Material Transformation

The studio investigation revealed contrasting material transformations between sappan wood and river stone. While both materials were developed into natural pigments, sappan wood required water-based extraction and pigment formation, whereas river stone underwent physical fragmentation and grinding. These different processes influenced material preparation and handling.

Sappan wood was transformed from solid wood into liquid colour extract and subsequently into pigment sediment, which was separated and dried. During pigment formation, alum combined with sodium carbonate produced a stronger, more saturated colour, while alum with calcium carbonate resulted in a softer tone. After drying, the colour differences became less pronounced, although slight variations remained visible. The treatments and preparation stages are presented in Table 1 and Figure 5.

River stone underwent fragmentation and grinding, initially producing a mixture of fine and coarse particles. Sieving separated the finer particles, while the remaining coarse particles were repeatedly ground to achieve a finer texture. This process demonstrated how the physical characteristics of the stone required adjustments during pigment preparation (Figure 6).

These findings demonstrate that natural colour is shaped not only by its source or final appearance but also by the processes of material transformation. The contrasting preparation methods influenced how the artist handled and responded to each material throughout the studio investigation.

Material Response and Studio Experience

Sappan wood pigment produced a smooth, watercolour-like consistency when mixed with binder. It was relatively easy to control on paper, whereas application on canvas was more difficult and less predictable. These differences highlighted the influence of surface characteristics on pigment handling. Despite repeated grinding and sieving, river stone pigment retained a slightly granular texture. However, its consistency and handling on paper were relatively similar to those of sappan wood pigment. These observations demonstrate how material properties and surface interactions influenced studio experience. Through direct engagement and observation, the artist developed practical knowledge of the materials during making (Ingold, 2007; Sullivan, 2010).

Material Response and Artistic Decision Making

Material responses influenced artistic decisions during pigment preparation and application. Sappan wood pigment was more difficult to control on canvas, prompting the addition of

water and adjustments to brushwork. For river stone pigment, coarse particles retained after sieving were repeatedly ground to achieve a finer texture.

These adjustments demonstrate how artistic decisions developed through direct engagement with materials rather than a fixed procedure. Observation and material response became part of the creative process, supporting the role of studio practice in generating practical knowledge through making (Sullivan, 2010).

Artistic Application and Artwork Development

The prepared natural pigments were developed into artworks to explore how material qualities influenced artistic decisions. Sappan wood pigment was applied through layering and variations in brushwork, while river stone pigment was primarily explored through controlled brush application. These approaches reflected the artist's direct engagement with each material. The completed artworks are presented in Figure 8.

The development of these artworks demonstrates how material preparation, observation and application contributed to artistic decision-making. Studio experimentation therefore functioned not only as material preparation but also as part of the creative process.



(a) (b)

Figure 8. Artworks developed through studio-based experimentation using (a) sappan wood pigment and (b) river stone pigment.

Discussion

The findings demonstrate that sappan wood and river stone undergo distinct material transformations before becoming usable natural pigments. Sappan wood required extraction and pigment formation, with variations in colour observed between the selected treatments. Previous research has similarly demonstrated the conversion of sappan wood extracts into lake pigments, although using different preparation methods (Girdthep et al., 2018). In contrast, river stone depended on physical reduction through repeated grinding and sieving. These differences suggest that the characteristics of natural colour are shaped not only by the original material but also by the processes involved in its preparation.

From a materiality perspective, these observations support (Ingold, 2007) emphasis on understanding materials through engagement and transformation. Within the studio, the presence of coarse stone particles required further grinding, while difficulties in controlling sappan wood pigment on canvas prompted adjustments in water content and brush application. These experiences demonstrate how material responses influenced artistic decisions rather than following entirely predetermined procedures. The interaction between artist and material therefore became an important part of the creative process. This relationship is also reflected in (Nimkulrat, 2010) discussion of how material engagement contributes to artistic expression within practice-led research.

The study also highlights the role of studio practice in generating practical knowledge through experimentation, observation and reflection (Nimkulrat, 2010) . Although both materials were developed into workable painting media, their different physical characteristics influenced preparation, handling and artistic application. These findings suggest that natural colour can be understood beyond its visual appearance, as a material process through which artistic knowledge develops. The study contributes to understanding how natural pigments can be explored within contemporary art practice through direct material engagement and artistic decision-making.

Conclusion

This study examined the transformation of sappan wood and river stone into natural pigments through studio-based practice. Sappan wood involved water-based extraction and pigment formation, while river stone required fragmentation, grinding and sieving. The pigment-forming treatments produced variations in sappan wood colour, although these differences became less pronounced after drying. During artistic application, sappan wood pigment demonstrated smooth handling on paper, whereas river stone pigment retained a slightly granular texture.

These findings highlight how material properties influence preparation, artistic handling and decision-making. Adjustments such as repeated grinding, adding water and modifying brushwork demonstrated how practical knowledge emerged through direct material engagement. From a materiality perspective, natural colour can therefore be understood beyond its visual appearance, as a process of transformation, observation and artistic response. The study contributes to understanding natural pigments as alternative materials within contemporary art practice, while acknowledging its limitations as a qualitative studio investigation without laboratory-based analysis.

Theoretically, this study demonstrates how a materiality-oriented approach can clarify the relationship between changing material properties and artistic decisions in studio practice. Differences in sappan wood pigment formation, repeated grinding of river stone, and adjustments to water and brushwork show how practical knowledge develops through material responses rather than final colour alone. Contextually, the study documents the use of sappan wood alongside river stones collected from Sedim, Kedah, and Sungai Siputeh, Perak, as painting materials within contemporary Malaysian studio practice. It offers a situated example of how natural colour can be explored on conventional supports while recognising that long-term colour durability and chemical performance remain outside the scope of this investigation.

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