The effect of oil on the making batik leather with chrome aldehyde combination to written and stamped batik

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Abstract. The purpose of this study was to determine the effect of the amount of oil on the manufacture of chrome-aldehyde combination leather on the quality of the skin. Goat pickle skin tanned by combination of chrome - aldehyde with variations of oil 2%, 4% and 6%, difinish with batik and stamp batik. Finishing with batik, the skin was previously drawn with a pencil on the nerf part in accordance with the desired motif, then batik according to the motif with batik wax heated 60 - 70°C on the skin that has been patterned using canting. For stamped batik skin, batik uses a copper stamp and is also attached to the skin on the nerf. Furthermore, the skin is coloured according to taste and removed from the wax uses batik wax that is rubbed on the waxed skin until the candle is released, then coloured again according to taste and in lacquers. Batik skin was then physically tested, FTIR tested and skin morphology. Physical test results show that the best oil use is 6% and FTIR test results, the groups in the skin of batik are C = C, C-N, and R2C = CH2. While the results of morphological testing of batik skin remain solid and when compared with the physical test the tensile strength remains high and low elongation.

1. Introduction

Batik is one of the original cultures of Indonesia. Batik has been known in Indonesia since the 5th or 6th century [1]. Batik is a handicraft as a result of colouring staining using the night (batik wax) heat as a colour barrier with the main tools attached to batik wax in the form of canting written and or canting stamp to form certain motifs that have meaning. There are three types of batik: written batik, stamped batik, combination batik (written and stamped), among the three types of batik, written batik has more exclusive value because the maker needs a longer time and has more artistic value (SNI 0239, 2014). At first batik was made on white material made from cotton called cloth mori. Today batik is also made on other materials such as silk, polyester, rayon and other synthetic materials [7]. Batik is a traditional dyeing technique using wax to create special pattern on textile. Batik is common among Javanese society and become the social and cultural identify [13]. Batik motifs and pattern are very diverse. Every region in Indonesia has a certain batik style in accordance with the characteristics and potential of the local area [5].

For the Javanese, batik is not only a popular decorated textile, but its application has been developed for woods and leathers. Today, Batik and Batik design are not only used for traditional costumes, but also used for modern fashion, many kinds of handicrafts and household items. Batik designs are printed and decorated on many kinds of handicrafts like leather handicrafts, wooden crafts, painting, household ceramics, pottery, gift ornaments, bamboo and many others. For Batik handicrafts the materials used are mostly: Woods, Ceramics, Leather, Silver [1]. Leather batik is one of the
potential commodities to be developed, considering that currently there is no competitor of leather products on the market so that the growth of the leather batik market tends to be high [17].

In the past various kinds of leather handicrafts, such as bag, wallet, footwear, etc. There are three main batik techniques: Hand-waxed (hand-drawn) called “Batik tulis”, Hand-stamped, called “batik cap” and Combination of both. Tanned leather dyeing technique, according [4] is using tanning drum, spray and brush. The application of batik to the skin is one type of finishing with a modified motif on the surface of the skin, to make it look attractive and beautiful.

Based on the latest data from ASEPHI (Association of Indonesian Handicraft Exporters), currently leather batik products on the market are from vegetable tanned leather, research on batik from tanned skin has been carried out including vegetable tanning [6], with chrome tanning [14].

One of the important factors that exist in making batik on the skin is that the paint cover provided must be able to bond tightly. If too much oil is used, then the lid paint cannot glue tightly, because the adhesive strength of the lid paint is affected by the oil content [22]. According to the research of [22], the optimum oil content used in the tanning process of chrome - intangible for leather batik is 6%. Therefore, in this study the oil content used was 6%. In this study, the skin used was goat skin with a combination of chrome-Syntan, chrome-aldehyde and chrome-aluminium.

According to [21], batik making includes three main jobs, namely sticking batik wax, colouringbatik and removing wax. Sticking to batik candles is several ways, namely by writing canting, with a stamp or painted canting or other tool. In order to be written on the fabric, this batik wax needs to be heated first with a temperature of 60 - 70 0C.

The oil content affects the strength of the finish adhesion, the physical properties of the skin tissue, the soft grip can be increased by using glutaraldehyde. The addition of aluminium chromium character can be maintained, as well as for grip, appearance and improved physical properties. Fullness can be increased by using a syntan combination [22].

Indonesia has been known for its batik since the 4th or 5th century, and it has been said that Indonesian batik dye techniques and designs are as numerous as its islands. As a matter of fact, batik is ‘wax writing’, a way of decorating cloth by covering a part of it with a coat of wax and then dyeing the cloth. It is a technique of covering parts of fabric which will not receive color. The waxed areas keep their original colour and when the wax is removed the contrast between the dyed and undyed areas forms the pattern [2].

2. Materials and Methods

2.1 Materials
Chrome – aldehyde, skin with 2%, 4% and 6% fat liquor, processed in Central Leather, Rubber and Plastics Yogyakarta. Batik wax and color acid dyes were obtained in Small Industries Yogyakarta; and chemicals for finishing process were used in this study.

2.2 Methods
30 pieces of pickle skin from goat skin tanned by a combination of chromium-aldehyde with variations of oil 2%, 4% and 6% to crushed skin, then finish with handmade batik and stamp.

2.2.1 Preparation before making written batik. The selection of motifs and the selection of batik motifs on the skin part of the nerf using a pencil. Leather combination of chrome-aldehyde and which has been given a motive soaked in water for 60 seconds.

2.2.1.1 Batik. Batik candles are heated at 60-70°C [21] using a small skillet. Next liquid wax is written on the motif that is drawn on the skin using canting writing.

2.2.1.2 Colouring process. Staining is done using brush, because it uses several colors, then after drying certain parts are closed / scratched using more candles and so on according to the desired motif and color.
2.2.1.3 Wax removal. Wax removal is done using a candle by rubbing until the wax is released.

2.2.1.4 Finishing process. The finishing process uses solvent lacquer solution which is dissolved with thinner by spraying, after being ironed dry using a hydraulic press machine.

2.2.2 Hand – stamp batik process

2.2.2.1 Preparation before batik. Leather combined with chrome - aldehyde soaked in water for 60 seconds

2.2.2.2 Leather batik. Batik candles are heated at a temperature of 60-70°C [21] using a copper miner. Next place the stamp on the copper miner containing liquid wax until the stamp is hot, then spread it over the skin. The process of colouring, removing wax and finishing the same way as making batik.

2.2.3 Testing

2.2.3.1 Physical testing. Physical properties tested include paint rubbing resistance test according to SNI 06-0996-1898, tensile strength and elongation according to SNI ISO 3376: 2012, crack strength of lid paint according to SNI 06-4574-1998 and adhesive strength of lid paint according to SNI 06-4083-1996

2.2.3.2 FTIR Testing. FTIR testing of chrome-aldehyde combination skin is code A6 or the use of oil in the process of making a combination of chromium-aldehyde skin is 6%

2.2.3.3 Morphological observation. Skin morphology was observed using a photomicrograph with a magnification of 400 X. These guidelines show the best layout for your paper using Microsoft Word. If you don’t wish to use the Word template provided, please use the following page setup measurements.

3. Results and Discussion

3.1. Physical Testing Results

The results of the physical skin test of the combination of chrome-aldehyde can be seen in table 1.

Table 1. The results of the chrome-aldehyde combination skin test results written in batik.

| No | Code | Tensile strength (kg / cm) | Elongation % | The paint crack resistance of the top cot | Paint rub resistance | The crack strength of the top cot |
|----|------|--------------------------|-------------|----------------------------------------|---------------------|---------------------------------|
| 1  | A2   | 348.71                   | 73.68       | 9.71                                   | Dry 3/4 Wet 4/5     | Dry 216.67 Wet 50               |
| 2  | A4   | 423.47                   | 83.10       | 8.55                                   | 3/4 4               | 166.67 50                      |
| 3  | A6   | 521.80                   | 71.19       | 9.06                                   | 3/4 3/4             | 116.67 25                      |

Information:

A2, A4, A6: is written batik leather from a combination of Chrome-Aldehyde leather with variations of oil 2%, 4% and 6%

From the data above, it can be seen that the highest tensile strength is in code A6 (521.80 kg / cm), which is the use of 6% oil in making leather with combination of chrome-aldehyde. Whereas for 4% (A4) oil use, the tensile strength is 423.47 kg/cm and for oil use 2% (A2) obtained a tensile strength of 348.71 kg/cm. Whereas for 4% (A4) oil use, the tensile strength is 423.47 kg/cm and for oil use 2% (A2) obtained tensile strength 348.71 kg/cm. The lowest elongation is also in code A6 (written batik skin with 6% oil variation), followed by A4 and A2 (written batik skin with 4% and 2% oil variations).
The lowest crack strength of paint cover is A4 (4% oil variation), followed by A6 (6% oil variation) and A2 (2% oil variation). For dry paint rubbing test the same is true of all variations of oil, namely ¾ (slightly faded), while for the wet paint polish resistance test the largest is A2, which is 2% oil variation with a value of 4/5 (does not fade). Next followed by A4, which is 4% oil variation with a value of 4 (slightly faded). The lowest test result of dry cap paint crack strength is A6, which is written batik skin with a variation of 6% oil, followed by A4 and A2, namely the variation of oil used is 4% and 2%. While the lowest test results of crack cap paint strength on written batik skin are variations in oil 6% (A6) with a value of 25 and followed by A4 and A2 (variations in oil 4% and 2%) with the same value of 50. It can be said that the use of the best oil from written batik skin is 6%. The results of the physical skin batik test combination of chrome-aldehyde can be seen in table 2.

| No | code | Tensile strength (kg/cm) | Elongation % | The crack strength of the top cot | Paint rub resistance | The crack strength of the top cot |
|----|------|--------------------------|--------------|----------------------------------|---------------------|----------------------------------|
| 1  | A2   | 457.24                   | 77.09        | 8.67                             | Dry 5 Wet 4         | Dry 176 Wet 50                  |
| 2  | A4   | 469.53                   | 61.22        | 8.00                             | 5 4                 | 116.67 25                       |
| 3  | A6   | 569.38                   | 46.69        | 8.85                             | 5 4                 | 166.67 25                       |

Information:
A2, A4, A6: are leather stamp batik from leather combination of chrome - Aldehyde with variations of oil 2%, 4% and 6%

From the data above, it can be seen that the highest tensile strength in the combination of chrome-aldehyde batik skin is code A6, which is stamped batik skin with 6% oil combination which is equal to 569.38 kg/cm, followed by stamp batik skin with 4% oil variation (A4) that is equal to 469.53 kg/cm and batik stamp leather with 2% (A2) oil variation that is equal to 457.24 kg/cm. The lowest elasticity of this printed batik skin is A6, which is stamped batik skin with 6% oil variation, followed by A4, namely stamped batik skin with 4% oil variation, and A2, which is stamped batik skin with 2% oil variation. While the lowest paint cap crack strength on the batik cap skin is A4, which is stamped batik skin that uses 4% oil variation, with a value of 8 mm, followed by A2, which is cap batik skin that uses 2% oil, with a value of 8.67 mm and A6 namely stamped batik leather that uses 6% oil with a value of 8.85 mm. The paint rub resistance test results from dry batik skin have the same values of A2, A4 and A6, which are stamped batik leather that uses 2%, 4% and 6% oil. The value is 5. While the results of the wet paint rub resistance test also have the same value of 4 of all oil variations (2%, 4% and 6%). The lowest test results of dry paint crack are A4, which is the use of 4% oil in stamped batik skin with a value of 116.67 and followed by A6 which is the use of 6% oil in stamped batik leather with a value of 166.67 and then followed by A2 which is the use of 2% oil, with a value of 176.

The results of the wet paint crack strength test A4 and A6 value (4% and 6% oil use are the same, 25, while the A2 value or 2% oil use is 50. From this data it can be said that the best use of oil on stamp batik is variation 6%.

3.2. FTIR Test Result
From the results of the physical test above, it can be said that A6 or 6% oil use is the best so that tested by FTIR is A6, which is leather combination of chrome-aldehyde with 6% oil variation.

The following are FTIR test results from both batik tulis skin combination of chrome-aldehyde and stamp batik from chromium-aldehyde combination skin FTIR Test Results of batik leather from A6.

Written Batik leather code A6
Fourier Transform Infrared (FTIR) spectroscopy is infrared spectroscopy which is equipped with Fourier transform for detection and analysis of spectrum results. Core FTIR spectroscopy is a Michelson interferometer, a tool for analysing frequency in a combined signal. The infrared spectrum is produced by transmitting light passing through the sample, measuring the intensity of light with the detector and compared with the intensity without the sample as a wavelength function. The infrared spectrum obtained is then plotted as an energy function intensity, wavelength.

From FTIR spectroscopic tests with samples of batik leather obtained infrared spectrum as seen in the FTIR image below.

![FTIR Image](image.png)

**Figure 1.** Picture of FTIR of batik leather.

From the picture above it can be seen that the peak is at 1750-1500, 1500-1250, and 1000-750. This means that on batik skin a combination of chrome-aldehyde has C = C, C-N, and R2C groups = CH2.

### 3.3. Test results for morphology batik skin

#### 3.3.1. Test results for morphology before batik leather.

At the figur 1 It can be seen that with a magnification of 400 X, the skin before batik looks brighter and a little paint on the small skin tissue is only the base paint. On the skin surface tissue looks solid.

The results of morphological testing of batik leather with a magnification of 400 times can be seen in the following figure. The skin before the batik looks brighter and a little paint on the small skin tissue is only the base paint. On the skin surface tissue looks solid.
In figure 2, it can be seen that the paint on the batik skin enters the skin tissue. The skin surface tissue looks dense and slightly thick, but when compared with the physical test (tensile strength is still high from all uses of oil variations, while for lowness it is also low for A6 batik/stamp skin or 6% oil use. Still meets the requirements SNI 0253: 2009 concerning the skin of the top of goatskin footwear. This means that the effect of oil on batik skin with a percentage of 6% can still be used.

4. Conclusions
The use of oil for the process of tanning batik skin with the best combination of chrome-aldehyde is 6%. From the results of the FTIR test, the functional groups on the skin of batik are C = C, C-N, and R2C = CH2. The morphological test results of batik skin combination of chrome-aldehyde look sol.

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