

Baking Soda as A Fixation of Remasol is an Effective Method for Colouring Batik to Be Combined with Other Types of Colours

Karsam

Dinamika University, Surabaya Indonesia

Abstract: Batik dyes are made from natural dyes and chemical dyes (rapid, indigosol, naptol, and remasol). Each batik dye requires a fixation material according to the type of colour used. Remasol colour (vinyl sulfone) is one type of reactive colour whose use is the most suitable to smear. Fixation of Remasol colour is using waterglass/sodium (Na_2SiO_3). Waterglass has a liquid nature, although it hardens easily after being exposed to the sun, it melts quickly when it contacts with water. Therefore, Remasol with waterglass fixation is not suitable when it is used with other colour combinations. For instance, it is combined with naptol. To produce a suitable combination, it is necessary to use baking soda [sodium bicarbonate (NaHCO_3)] as a fixation of remasol. In this study, it is explained about the method of baking soda as a fixation of remasol as a batik dye combined with other types of colours. The result of this research is that baking soda as a fixation of remasol requires a ratio 1 : 1 (1 gram of baking soda : 1 gram of remasol). To produce a colour that matches the guidelines, after being applied, 72 hours of drying is required, after that it is blocked (covered with hot wax). This method can be used to colour batik with the dip dye technique which can be combined with naptol, rapid, and indigosol colours. The result of this study is expected to increase the number of colour variations in one sheet of cloth. For example, one sheet of cloth can use naptol, rapid, and indigosol. Because naptol, rapid, and indigosol have different colours, for example, naptol, rapid, and indigosol do not have turquoise blue. Turquoise only exists in remasol, and vice versa. The shortcoming in this research is that the experimental method carried out is still simple and has not used detailed laboratory test.

Keywords: Baking soda, Remasol, Colour combination.

1. Introduction

The purpose of this research is to produce a batik colouring process using baking soda as a remasol fixation combined with other types of colours. What is meant by baking soda/sodium bicarbonate (NaHCO_3) is an alkaline substance and reacts to acids such as vinegar (Sri Herlina, 2013). Baking soda is a leavening ingredient commonly used in food mixes, so that food can expand. These foods are usually baked such as cakes, muffins and biscuits and contain only sodium bicarbonate. Naturally this material is alkaline. Fixation is a feeling of being attached/centered to something excessively [1]. Fixation is the process of mixing substances between batik dyes and other substances as catalysts. After being mixed, the two substances will bind each other so that after the colour dries, it will not fade after being washed. As what is meant by waterglass/sodium silicate (Na_2SiO_3) is a strong alkaline compound in the form of colourless thick liquid. In waterglass industry as a binder for reactive dyes and as a colour enhancer for batik in the fixation process [2]. While what is meant by combination is combining batik colours such as remasol with rapid, naptol, and indigosol. Previous research has been submitted (Larasati et al., 2020) with title "Batik Home Industry Wastewater Treatment Using UVC/Ozon Oxidation Method: Case Study in Cibelok Village, Pemalang, Indonesia". This article only discusses the use of remasol with waterglass fixation. As well as in the journal [3] an article that discusses the description of batik and dyes, this article only explains that remasol is a reactive colour type.

The previous researches have also been submitted by several people such as: [4], (ISFANDIARY, 2019), [5] but they study more about natural dye extracts. [6], and (Sri Herlina, 2013) have already explained about the process of batik using various types of colours, but the colouring process using remasol with baking soda fixation has not been explained.

On popular websites such as in [7], only explains that baking soda is good for reactive type colour mixtures. The same thing is also conveyed on the [8]. These popular websites have not explained how the process is, how long the waiting time is, and how to combine it with other types of colours.

In this study, the use of baking soda as a fixation of remasol in batik colouring will be presented in combination with various other colours. The same is explained in the book " [9]" and in the book " [10]"

In journal <http://e-journal.uajy.ac.id> "deskripsi batik dan zat pewarna" and Karsam (2019) explains that batik dyes can be grouped into two, namely natural dyes and chemical dyes. Natural dyes are dyes derived from leaves, fruit, flowers, and tree bark, such as Teak trees, Mahogany trees, Ginger, and others. While chemical colours can be grouped into four including rapid colours, naptol colours, indigosol colours, and reactive colours such as remasol.

To be able to be used as a batik colour, all colours require mixed colour materials. What is meant by mixed colour material is the material to speed up the reaction which is called a catalyst. In batik terms "catalyst" is called fixation or turning off colour. Fixed means that the colour is turn off, so that the colour does not fade when the cloth is washed.

Being explained by (Hasnelly et al., 2014), also (Pujilestari, 2014) that the fixation material for natural colour is alum (double salt of aluminium sulfate/ $\text{Al}_2(\text{SO}_4)_3$, lime water or potassium carbonate (K_2CO_3), and tunjung or Ferrous Sulfate (FeSO_4). To produce a light colour (light brown) alum fixation is required, a medium colour (brown) requires lime water fixation, and dark brown (dark brown) fixation of tunjung is required (Karsam, 2019).

As for the types of chemical colours are Rapid, Naptol, Indigosol and Remasol.

1. Rapid

Rapid is naptol dye mixed with naptol diazonium salt. That's why some say rapid is the colour of naptol that has been turned off. Rapid colour is the most suitable colour for smearing. This colour is simply mixed with hot water and the applied to the cloth. After being smeared, the fixation is simply heated under the sun or simply by blowing the air for 12 hours or

overnight. Rapid colours are red, blue and black. However, the best rapid colour so far is red. The result of blue and black is still like grey.

2. Naptol

Naptol (As) is a type of synthetic dye that is popularly used for traditional batik colours, in general it is suitable for dyeing techniques by immersing, but it can also be smeared. Traditional batik is batik that is carried out from generation to generation by the palace community and then developed into rural communities, especially on the island of Java. At first, this naptol developed along with the use of sogu/sogan (the process of giving brown colour) from the sogu and wedeland trees (the process of giving a blue colour). Naptol colour has a concentrated nature. Batik that uses naptol colour tends to be thick and concentrated.

After batik was recognized by UNESCO on October 2, 2009, batik as a non material heritage of the Indonesian Nation, batik colouring has developed rapidly. The discovery of natural colour, and the use of reactive types of colours continuous to grow. In simple terms it can be explained that the use of naptol colour is divided into 2 solutions. The following 2 solutions are used to dye 1 meter of batik cloth.

A. Naptol solution consisting of:

Naptol	: 3-5 grams
TRO	: 1.5-2 grams + 5 cc cold water
Caustic soda	: 1.5-2.5 grams
Boiling water	: ¼ liter
Cold water	: ¾-3 liters

The way to make naptol solution:

TRO (Turkish Red Oil) is dissolved in one cold water then add naptol and stir until blended into a paste. Then add boiling water, mix well. After that add the caustic soda (NaOH) stir until the solution becomes clear. At the time of adding the caustic soda do it carefully because the solution can hit up and overflow.

B. Salt solution consists of:

Diazonium salt	: 9-15 grams
Cold water	: 1 liter

The way to make salt solution:

Add salt into a glass add cold water 5 cc then stir. After that put it in 4 liters of cold water.

Karsam (2019) describes the colouring process in detail, in brief that after the cloth is deeped in a naptol solution, it is then drained. After that it is deeped in a salt solution, that drained. Repeat it again and again until the colour turns into the one which is desired. Figure 1 below is a naptol colour picture.

3. Indigosol

Indigosol belongs to the class of water-soluble fessel colour paints. This colour paints is widely used in batik, whether it is used as dye paint/colour pint. Indigosol is a batik dye that needs fixation with hydrochloric acid (HCL) or sulfuric acid (H₂SO₄) or fixation under sunlight. For yellow, green, brown and red need acid fixation, but some colours like pink and violet can be fixed with sunlight.

In general, indigosol paint has a light colour base which is shiny and has good resistance to sunlight and friction. For indigosol colour, 2 solutions such as naptol colour are also needed. The materials needed for dyeing indigosol for 1 meter of cloth are:

A. Indigosol solution:

Indigosol	: 3 grams
Natrium Nitrit (NaNO ₂)	: 6 grams
Cold water	: 5-10 cc
Hot water 60 degree C	: ¼ liter
Cold water	: ¾ liter

B. Acid solution:

Water	: 1 liter
HCL or H ₂ SO ₄	: 3-10 cc/1 liter cold water

Karsam (2019) describes the indigosol colouring process in detail, briefly, after the cloth is dyed in an indigosol solution, it is then drained. Repeat it again and again until the colour turns into the one which is desired.

4. Remasol

Remasol is a vinyl sulfone reactive dye. Remasol is a substance that can bind directly to the fiber addition reaction (when applied). Like water colour, the colour is applied on paper and it is immediately visible. The colour of remasol can be directly identified by its colour form, forming a covalent primary bond which is an ether bond (Suhartini, 2018). Remasol dye is a batik dye commonly used for the smearing technique. Therefore, in one sheet of cloth, several colours of remasol can be used. The following is the composition of the remasol colour solution.

Way 1:

Materials needed for Remasol solution:

Remasol	: 3 grams
Hot water	: 50 - 100 cc
Fixation	: waterglass (sufficiently)

Remasol is put in a glass stirred with hot water. Ready to smear or dip. After that the cloth is drained and then fixed with waterglass. At the time of removing the wax, the water still cannot be mixed with soda Asti/gray/sodium carbonate (Na_2CO_3).

This method is generally used by batik maker

Way 2:

Materials needed for Remasol solution:

Remasol : 3 grams

Baking soda : 3 grams

Hot water : 50 – 100 cc

Fixation : not needed but can be blocked

Remasol is put in a glass mixed with baking soda (1 : 1 ratio) and mix well with hot water. Ready to smear or dip. To make the colour not to fade, then at the time of removing the wax, it can be done twice. In the first time of removing the wax, water is mixed with fixanol, then in the second time of removing the wax, water is mixed with waterglass.

2. Materials and Methods

The method used in this research is experimental. The experiment was carried out using an open room with sunlight and a closed room/oven room with a temperature of 38-degree Celcius. The report was presented in descriptive form. The research data were obtained by means of experiments and literature review as well as internet sources. The researcher is a batik doctor, batik teacher, and batik maker. Therefore, in this research, the researcher acts as a data source.

In introduction part, it has been explained that in previous studies, making batik using Remasol colour is using waterglass fixation. The batik process is carried out as shown in figure 1 below.

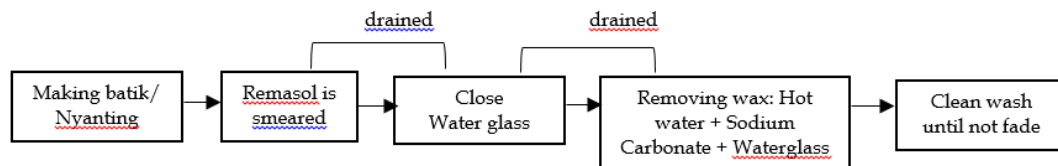


Figure 1 Making batik process using waterglass fixation

(Source: [6])

In figure 1, it can be explained that after Remasol colour is drained then covered with waterglass then drained again, The process of covering with waterglass can be carried out in various ways. Every batik maker has their own way:

- After being covered with waterglass, the cloth is dried at least for 6 hours.
- After the cloth is coloured with Remasol, drained then soaked in waterglass for about 24 hours.
- After the cloth is coloured with Remasol, drained. Then the cloth is rolled using plastic with water glass. Then set a side for about 12 – 24 hours.

After the process is carried out then washed cleanly. The process is carried out only to colour batik just using Remasol, with other colour combination. In this research, there is an explanation on the process of Remasol colouring with baking soda fixation with other types of colour.

The process of Remasol colouring with baking soda can be explained in figure 2 as follows:

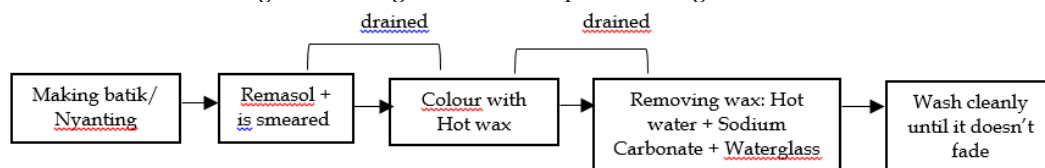




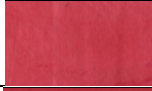
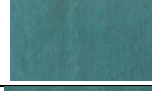
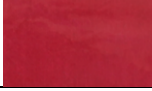
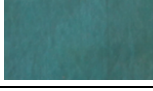
Figure 2 The process of batik making using Remasol + baking soda

(Source: [6])

The experiment result in the use of Remasol colouring with baking soda fixation has been carried out for several times by the researcher. The experiment was carried out using two colours of Remasol (Malaysia), namely Brilliant Red and Blue Green GB. The experiment was carried out with the aim of knowing the density of the resulted colour against how long the waiting time was, after the colour was applied to the cloth.

The experiment was carried out by mixing Remasol with baking soda using hot water. The mixed formula has been explained above. After becoming a mixture of colours, then the colour is applied to the cloth. Then it is drained/set a side. This draining time is different/needs to be considered, because the resulted colour density is different. After the cloth is drained then it is covered/blocked with boiling wax (100 ° C), then it can continue to the next stage of making batik. The waiting time of the research is limited only for 3 days and 3 nights (72 hours), because the resulted colour has been in accordance with the Remasol colour guidelines. The following table 1 is the result of the colour experiment of Brilliant Red and Blue Green GB mixed with baking soda.

Tabel 1
 The colour experiment result of Brilliant Red and Blue Green GB mixed with baking soda

No.	Waiting time to the Next process	The red colour resulted	The blue resulted
1.	12 - 24 hours (a day and Night)		
2.	36 - 48 hours (two days and Two nights)		
3.	60 - 72 hours (three days And three nights)		

(Source: Karsam, 2021)

The experiment result on table 1 can explain that the density of red and blue, influenced by the length of time to stand still/wait. It means that after the colour is applied to the cloth, it cannot be processed to the next stage directly. At least for the next process it needs time to stand still/wait for 72 hours (3days and 3 nights) and then it is blocked to move on the next stage.

The following are the results of the research on the Remasol colouring process with baking soda fixation combined with rapid colour and naptol.

a. Preparation stage

The preparation stage is not explained in detail. The preparation stage consists of: preparing the cloth , mordanting (cleaning the cloth), and making patterns with apencil, designing, and making patterns with a pencil, designing, and making patterns with a pencil on the cloth, After that the cloth is processed in canting stage (being lengrenge).

b. The cloth is spread out, like the one in figure 3. *Note: figure 3 to figure 14 are photos of Karsam's research.*



Figure 3 The motif is stretched
 (Source: Karsam, 2021)

c. The cloth is smeared with red rapid

Red rapid (1 gram) mixed with hot water (5 - 10 cc) stir well. Then it is smeared on the cloth. After that the cloth is dried in the sun (0.5 - 1 hour). It may be drained until the colour turns to red/ put it on oven with the temperature of 38 ° C for 1.5 - 2 hours. Figure 4 smearing rapid colour.



Figure 4. Smearing red rapid colour
 (Source: Karsam, 2021)

d. Smeared with the mixture of Remasol and baking soda

It is explained above about Remasol solution with baking soda. The materials needed, namely:

- Remasol : 3 grams
- Baking soda : 3 gram
- Hot water : 50 - 100 cc

Remasol is put in a glass, mix it with baking soda stir well with hot water. The solution is ready to smear. At the time to smear, make sure all the canting result is in a good condition and see through to the back of the cloth. This method is also applied when you use rapid. If cantingan does not penetrate throug the back of the clth or is broken, then the colour of smearing will be overflow out of the line. Likewise, the brush used for smearing, it must be considered both the size of the brush or the quality of the brush. Figure 5 is smearing remasol colour + baking soda.



Figure 5 Smearning Remasol colour + baking soda
(Source: Karsam, 2021)

e. Dried and set a side

After the cloth is smeared with Remasol colour + baking soda, then the cloth is dried under the sunlight (0.5 – 1 hour) or put in oven room with the temperature of 38 degree Celcius for (1.5 – 2 hours). To produce a better colour, after the colour is dry it is necessary to set a side it for 2 days. If we use mori cloth, suach as prima 70/60, then must be set a side for 3 days. The experiment in figure 8 is using the cloth with good quality (primisima cloth). Figure 6 the cloth is dried.



Figure 6 The cloth is dried
(Source: Karsam, 2021)

F, Being blocked

Being blocked or blocking means to cover with hot wax so that if it is dipped in other colour, the colour which is blocked will not mix with other colour. This research aims to produce batik colour, so the colour has been smeared with Remasol + baking soda must be blocked. The purpose of blocking the Remasol colour + baking soda, besides covering it so that it will not be mixed with other colour, it also has a function to strengthen colours. The colour is darker and does not fade when it is washed. Figure 7 the researcher is blocking.



Figure 7 Blocking
(Source: Karsam, 2021)

g. Dipped in colour

After being blocked, the cloth is dipped in colour. The colour used can be indigosol colour. The colour used can be indigosol colour and naptol. In this research in figure 8 the motif of the background is still plain white. Plain means that there is not any background motif yet. After that the motif will be dipped in colour of naptol yellow. Figure 8 is about the cloth after being dipped in naptol yellow colour then set a side it.



Figure 8 Yellow Naphthol Dip
(Source: Karsam, 2021)

h. Decorating the background with batik and blocked

The cloth on figure 8 has the background of plain yellow. The yellow colour of the background then is processed with canting to make the background motif or blocking to produce yellow colour. Figure 10 the colour of yellow is the background motif and the motif of blocking which has been dipped in brown colour.



Figure 9 Canting processing to make the background motif turning to yellow colour
(Source: Karsam, 2021)

i. Dipped in the second colour

After being processed with canting to produce the colour of the background as seen in figure 9, then the cloth is dipped in the second colour. In this research, the second colour uses brown naptol. After being dipped in brown colour, the cloth is dried or drained. Figure 10 is the picture of the researcher who is dipping the cloth in brown colour.



Figure 10 Being dipped in brown colour
(Source: Karsam, 2021)

Figure 11 is about the cloth after being dipped in brown colour (the first dip) then drained, the time of draining is about 0.5 – 1 hour under the sunlight. The first dip is brown colour, the result is less maximum (les brown), then it is necessary to be dipped again or dup it again and again according to the need.



Figure 11 Drained
(Source: Karsam, 2021)

Figure 12 is about the cloth dipped in brown colour (the second dip) and drained, the time of draining is about 0.5 – 1 hour under the sunlight.



Figure 12 Second dye brown
(Source: Karsam, 2021)

Note:

After this stage is finished, the batik colouring may be considered to be finished. The next stage is removing the wax. However, if it is combined with other colour, then blocking should be done and dipped again like the stage above on point h and i and so on.

j. Removing the wax

Removing the wax is the last stage of batik making process. This process is putting the cloth in boiling water. The purpose of removing the wax is removing the attached wax on the cloth after canting and blocking processes. After the cloth is drained for 0.5 – 1 hour, the next step is that the wax on the cloth is removed. If the Remasol colour is fixed with waterglass, it is enough to use one stage of removing wax. While if the Remasol used is mixed with baking soda, then it needs twice of removing the wax processes. In the first process of removing the wax, prepare the solution consisting of water + fixanol (fix oil). Put water + fixanol into a pan, heat until the water is boiling then put in the cloth. Pull and put the cloth into the pan over and over again until the wax is removed thoroughly or almost clean. In the second process of removing the wax, prepare a solution consisting of water + waterglass. Put the water + waterglass into the pan. Pull and put the cloth into the pan over and over again until the wax is removed cleanly.

As a note: For the first process of removing the wax, there are several batik makers who do not do it. The batik maker just soak the cloth with fixanol for 3 – 6 hours, after that the wax is removed by using the solution of water + waterglass. Figure 13 the researcher is removing the wax. After the wax is removed, the cloth is washed cleanly then drained, it means that the batik ready made. Pay attention to figure 14, the cloth is ready made. The batik motif produced named “*Wahyu Tumurun*” motif.



Figure 13 Removing the wax
(Source: Karsam, 2021)



Figure 14 Ready made batik
(Source: Karsam, 2021)

From figure 14 the colours produced, namely:

- Red rapid colour
- Remasol black colour
- Remasol blue colour
- Remasol *turkish* blue colour
- Naptol yellow colour
- Naptol brown colour

Conclusion

The result of the research concludes that to produce the colour combination in batik making, we can use Remasol colour combined with other colour. Generally Remasol colour is fixed using waterglass. When the Remasol colour is covered with waterglass, the cloth will turn to be hard. In this condition, the cloth cannot be combined with different colour, because when the cloth is smeared with different colour, then the waterglass will melt and the colour will be broken.

To produce the combination with different colour, then Remasol can be mixed with baking soda. The Remasol colour mixed with soda, the colour will not be broken or fade if it is put into water. To produce the colour we want, the smeared cloth is necessary to be set aside for 2 – 3 hours suited with the quality of the cloth. Besides, to produce a better colour, the colour should be blocked.

Blocking in this stage, besides to produce a better colour, blocking also has a function to cover colour so that it will not mix with other colour, when the colour is dipped other colour is dipped other colour (besides combination colour).

The last stage in batik making is removing the wax. Because it uses baking soda as the mixture, then the process of removing the wax needs to be carried out twice. The first, hot water is mixed with fixanol, the second, hot water is mixed with waterglass.

Suggestion

In this research, the researcher is a batik maker of a home industry. The experiment was carried out at home like any batik makers in general. The experiment is not carried out in a laboratory with detailed supervision in every hour. The supervision was carried out based on daily works. If it is carried out in a day, how is the result?, In two days, how is the result?, and so on. Therefore, for other batik maker or researcher, it will be better if the experiment is carried out in a laboratory and supervised accurately in every hour.

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