Application of Active Charcoal as An Ingredient of A Natural Bleaching Teeth

*Mirna Febriani[1], Ferry Jaya[1], Harwidadtih Ayuning Tyas[2], Inne S. Sasmita[3]**

1. Dental Teaching Staff Materials, Faculty of Dentistry, University Prof.Dr. Moestopo (B), Jakarta, Indonesia.
2. Student Academic Program, Faculty of Dentistry, University Prof.Dr. Moestopo (B), Jakarta, Indonesia.
3. Department of Pedodontics Dentistry, Faculty of Dentistry, University Padjadjaran, Bandung, Indonesia.

Abstract

Dental bleaching is one of the most common clinical procedures that are used to change the color of teeth and dental aesthetic fix through a process of chemically. Active Charcoal can be used as a natural bleaching the teeth changing color and contain elements of carbon to brighten teeth color and evacuate the plaque. Research objectives to know the benefits of active charcoal as an ingredient of a natural bleaching the teeth.

The specimen is divided into three working groups with each group consisting of 10 specimens per treatment. Measure the thickness of the enamel of the teeth in each group and the active charcoal weighs 100 mg. Measure pressure Electronic Toothbrush 300 up to 400 N/m2. Apply toothpaste pea-sized toothbrush and above flattened on the toothbrush. Place the charcoal active 100 mg. Apply some toothpaste that has been affixed to the active charcoal to the surface of the specimen by means of brushing with minimal pressure using the technique of small circular motion. After the dry specimens, performed measurements of the color after exposure of active charcoal with the VITA Easyshade V. Incisive Teeth 1 upper jaw contained gutap patchwork in the root canal which has been presented with active charcoal for 10 minutes, 20 minutes and 30 seconds changes color. Seen from an increase in the value of light, chrome, and hue after exposure.

Active Charcoal which is displayed on the surface of a tooth can lead to the occurrence of discoloration of the teeth. The discoloration occurs due to the presence of the substance carbon negative ion charge which attracts a positive charge of ionic substance.

Experimental article (J Int Dent Med Res 2019; 12(4): 1310-1321)

Keywords: Active charcoal, discoloration, tooth.

Received date: 27 October 2018 **Accept date:** 19 May 2019

Introduction

Dental bleaching is one of the most common clinical procedures that are used to change the color of teeth and dental aesthetic fix through chemical processes. According to the ADA Council on Scientific Affairs (2009), in 1980 in the field of dental bleaching changed dramatically along with the development of the classified be vital bleaching and non-vital bleaching, in – office and home bleaching.[1] Dental bleaching material used is hydrogen peroxide and carbamide peroxide.

Corresponding author:
Inne S. Sasmita
Department of Pedodontics Dentistry,
Faculty of Dentistry, University Padjadjaran
Bandung, Indonesia
E-mail: innesuhernasasmita@yahoo.co.id

Hydrogen peroxide is both unstable and at very high concentrations can be mutagenic.[2] in addition, hydrogen peroxide can inhibit enzyme activity pulpa causing a permanent change in the pulpa.[3] Carbamide peroxide is more often used in home bleaching procedures than hydrogen peroxide because carbamide peroxide is more secure and fewer cause side effects.[4]

Carbamide peroxide is a combination of hydrogen peroxide and urea.3,4 Carbamide peroxide with a concentration of 100% commonly used at home bleaching procedures, this concentration has been approved as safe and effective by American Dental Association (ADA) for the use of outside dental clinic.[3]

The effectiveness of the bleaching process of carbamide peroxide as home bleaching materials there is no successor, but using them to date still being debated because the effects posed against the oral cavity such

as irritation of the gingival and teeth sensitive.[3,5,6] The downside of carbamide peroxide and hydrogen peroxide to make researchers looking for alternative natural dental bleaching materials that are safer and more accessible.

Active charcoal can be used as natural bleaching the teeth changing colors, in research conducted by Zakaria (2016), one of the most important active charcoal as a specialist in cleaning the mouth is utilizing carbon elements there in to brighten the color of teeth and evacuate the plaque.[7] Active charcoal will be one of the best materials for bleaching teeth and dental bleaching in the world. This is the result of negative ion charge carbon substance that has the capacity to attract positive ionic charge substance, such as insecticides, herbicides, chlorination of hydrocarbons, heavy metals ions, and phenol. His appeal makes the substance brought bonds out from the mouth and body.[7]

Charcoal active is a natural bleaching material that is sold cheaply, easily obtained at pharmacies because it is sold freely and considered as adsorbents (substance binding).[8] According to the research of Ansari (2009), the nature of adsorbent (substance binding) obtained the shape of the microcrystalline graphite and non-porous structure which has been processed to develop its internal porosity.[8]

Active charcoal has a high porosity, surface area, and surface reactivity level is high. On the research of Letteri (2015), one active charcoal capsules affixed toothpaste with a dose the size of a pea and then brush your teeth with minimal pressure on the tooth surface active charcoal then let sit for 5 minutes to contact with the surface of the teeth. Active charcoal generally has positive effects on dental health and the mouth.[8,9]

Active charcoal is a broad-spectrum agent that effectively tie many pollutant compounds (organic, inorganic, biological and microbe).[8] The efficiency of absorption of the substance affected a variety of factors such as pH, the ionic strength of saliva, time of deployment, the procedure of modification, physical properties (surface area, porosity) and chemical properties of the active charcoal.[8,9] Advantages of active charcoal has a strong binding power so that at the time of tooth surface applicable will be retrieved color change enamel teeth significantly.[8]

Another advantage that is has no limit on consumption. When ingested up to 100 grams will not cause any side effects. Therefore, the active charcoal is not absorbed by the body, but the active charcoal absorbs all dirt, oil, toxins in the digestive, toxins in the body.[10] It is clear that active charcoal is proven safe when silenced in the mouth and out of contact with the teeth within 5 minutes to perform the procedure of dental bleaching.[10]

Variation in time spent based on time-frequency active charcoal contact with the surface of the tooth is left for 5 minutes as much as 2 times in a day.[11] On the research of active charcoal against enamel of teeth that have been tested, There is discoloration of the enamel of the teeth significantly with active charcoal applied for 10 minutes twice a day.[11]

The color of the teeth is determined by the color of dentin and enamel. Tooth enamel is the natural color of white translucent with tooth structure under the enamel colors tend to appear. Enamel, dentin under the normal color yellowish but because of the structure of the porous and the existence of the nerve of the tooth will penetrate the dentin color that caused the tooth color darkens to brownish yellow. Tooth color is affected by intrinsic color combination and the existence of extrinsic stain stuck on the surface of the tooth. Any changes in the enamel, dentin or pulpa Coronal structures can cause changes in the color of light on transmission gear. Extrinsic Diskolorasi caused by the substance from outside gear includes food or beverages in the daily consumption of tea, coffee, syrup, and smoking. Diskolorasi intrinsic caused odontogenesis or post-eruption and local factors namely pharmaceuticals, materials, and restoration of network decomposition pulpa.[12,13]

The Process of Changing the Color of Teeth

Extrinsic staining is superficial staining and affects only the outer surface of the enamel. The process of occurrence of dental coloring because chromogen food or drink

(coffee, tea, wine) is absorbed into the plaque or the acquired pellicle or chromogen deposit to the surface of the tooth so that it can generate a color because of the double bonds that are interconnected with the surface of a tooth through an ion exchange.

Intrinsic staining caused material chromogenic in the enamel and dentin, both during odontogenesis and after the eruption. Intrinsic staining after eruptions occurs as a result of trauma to the teeth push toward bleeding pulpa or necrosis. According to the research of Ross Kerr and Jonathan (2007), hemolysis release hemoglobin, which gets relegated to release iron. Iron combines with hydrogen sulfide to be iron sulfide that spread into the dentin tubules and produce a bluish or black coloring.[14] Failure to take all the remnants of the pulpa during therapy endodontic also cause staining. Dirty or brown color on the teeth are characteristic degradation pulpa without bleeding which gives a protein degradation or necroses network.[14]

Dental Bleaching

Teeth whitening or commonly known with the term (Bleaching) is an action to whiten teeth using chemically strong oxidizing materials i.e. peroxides.[15] Teeth whitening process was first described in 1864 and has developed until today. How teeth whitening treatment tailored to the type of staining that occurs.

The conventional treatment is to eliminate the extrinsic tooth staining is with actions scaling and polishing of the teeth. But for extrinsic staining which is difficult to be eliminated or intrinsic staining, it is necessary to other treatments including teeth whitening process.[16] Conventional tooth whitening process, use oxalic acid to dental materials vital and calcium chloride from limestone for a non-vital teeth.[17]

Basically, the process of removal of tooth whitening is done with color which means removal of tooth color so that the color back to the original color or bleaching tooth whitening which means. There are two kinds of ingredients to whiten teeth that are using bleaching or whitening products (non-bleaching). Bleaching materials help to eliminate staining which originated from within the tooth (intrinsic) and also the staining on the surface of the teeth (extrinsic), the results of which can change the color of the original tooth. Whitening products (bleach) just to remove the staining on the surface of the teeth, contains ingredients that work eliminating action with staining and physical chemistry.[18] There are several kinds of teeth whitening ingredients that have been used such as sodium hypochlorite, sodium perborate, and hydrogen peroxide.[16]

Tooth Bleaching Materials

Teeth whitening is a popular aesthetic procedure because it has a simple technique, the results are satisfactory and do not require a healthy tooth structure disposal. For the process of bleaching teeth with the use of chemical materials, primary teeth whitening ingredients i.e. contain peroxide include hydrogen peroxide, carbamide peroxide/urea peroxide. Whereas the nonhydrogen peroxide containing sodium chloride, oxygen, sodium fluoride. This bleach chromogens in emails and dentin, thereby reducing the surface color of teeth. The results obtained increased brightness and decrease of chroma. The whitening effect can be more effective with a higher concentration and treatment time or extended.[13,19]

Hydrogen peroxide is known as dihydrogen dioxide, dioxide, hydrogen peroxide, and oksidol, with the chemical formula H2 O2, pH 4.5, clear liquid, colorless and odorless, the molecular weight of 34.0147 g/mol and more viscous than water. It has very strong oxidizing properties and is used as an ingredient of whitening (bleaching) as well as a disinfectant.

Hydrogen peroxide is relatively unstable and undergoes decomposition of vertically and at very high concentrations can be mutagenic.[20] Hydrogen peroxide can be dissolved in the water and cause the atmosphere sour, for pH 1% solution is 5.0-6.0. On the technique of in-office typically use a high concentration of hydrogen peroxide that is 30-35%, while at home bleaching technique of concentration of hydrogen peroxide that is used is 10%. Overall safe hydrogen peroxide whitening materials used in concentrations are regulated.[21,22]

Carbamide peroxide is more often used in the procedure of the type of home bleaching

than hydrogen peroxide because carbamide peroxide is more secure and less cause side effects. The right materials to perform the procedure with teeth bleaching is active Charcoal, where Charcoal is one of the active natural ingredients that can be used to whiten the back teeth that have changed color. Active Charcoal has the nature of adsorbent (substance binding), so the active Charcoal can lift the chromogen deposits on the teeth causing teeth to seem whiter.[7]

Since both Cavex and TG composites had an approximately the same filler percentage by weight (72% and 74% respectively), the main cause behind this difference in compressive strength values before and after bleaching is in the resin matrix. Cavex composite contained only one type of resin matrix (Bis-GMA without diluents monomers) while TG composite contained three types of resin matrixes (Bis-GMA, TEGDMA and UDMA with diluents monomers) and the incorporation of TEGDMA diluents monomer in TG composite showed less resistance to the bleaching material than the principal monomers (Bis-GMA and UDMA) in spite of its high mean compressive strength value before bleaching in comparison with Cavex composite.[23] Of the two TG and Cavex composite restorative materials tested significantly affected by the bleaching agent.[24]

Active Charcoal

Active Charcoal or charcoal is a porous solid containing 85-95% carbon, produced from materials containing carbon with warming at high temperature. In addition to the charcoal is used as a fuel, can also be used as adsorbent (absorbent). Absorption is determined by the surface area of the particles, and this ability can be higher if the activation is done with charcoal warming at high temperatures. Thus, the charcoal will experience changes in the physical and chemical properties. Charcoal is thus referred to as the active charcoal.[25]

Figure 1. Active Charcoal

In General, this activated carbon prepared from basic ingredients of coal and biomass. Essentially, the basic materials makers of activated carbon must contain the element carbon.[26]

Figure 2. Active charcoal raw materials (coal)
Source: technical active Charcoal. Indonesia National Standard 26

Results

Active Charcoal Making Mechanism

Carbon materials (the origin of the animals, plants, minerals) with a high concentration of carbon can be converted to activated carbon (chemical activation method using or gases), the most common raw materials are wood, charcoal, Coal, fruit, nut Brown and bitumen, lignite, peat powder, bone and paper (lignin). Synthetic polymers such as PVC, used for the manufacture of activated carbon. Activated carbon obtained from hardwood is more often used for adsorption because charcoal obtained from softwood, like pine wood, not very stable and easily destroyed.

Enable active carbon with a method that is less than 25% humidity, it is carbonated in advance at a temperature of 400-500oC to eliminate most of the volatile material and then carbon oxidizing gas is usually presented with a using carbon dioxide or steam at a temperature of 800-1000° c or with average air temperature, to a more selective oxidation.

Oxidation of activated carbon is usually preceded by carbonization of primary raw materials. Pyrolysis of wood started at a temperature of about 225oC. Carbon is oxidized by atmospheric oxygen is oxidized to CO2, so the air must be removed or should be very controllable during carbonizing and activating. Steam and carbon dioxide acts as a mild oxidizing agent at 800-1000oC as follows[8]:

$C_x(H_2O)yC$ (s) + y H2O *Carbonization*
C (s)+ $2H_2OCO_2$ + 2 H_2 ⟶ *Steam activation* (H = +75 KJ)
C(s)+$CO_2$2 CO ⟶ *Activation by* CO_2 (H = +159 KJ

Activation charcoal consists of thermal treatment in the high temperature (800-1000oC), as a result, imperfect combustion and evaporation occur. Then the surface of the carbon is greatly improved to eliminate hydrocarbons or tars (Figure 7).[8]

Figure 3. The activation process of carbon gradually during the treatment temperature. Source: International Journal of ChemTec Research-Activated Charcoal[8]

Natural Bleaching Techniques with Active Charcoal

Teeth whitening (bleaching) vital under the supervision of dentists consists of two techniques that are in office and home bleaching. The technique of bleaching in the office can quickly change the color of teeth become whiter. This technique is a vital tooth whitening done in clinics, use hydrogen peroxide with a high concentration that is 30-35%. This technique is used on patients who can not use a tray or on patients who want white teeth fast and controlled directly by the dentist. The next technique is the technique of home bleaching also supervised home dental nightguard vital bleaching or whitening.[21]

Home bleaching technique using an instrument resembling a protesa called tray or a night guard and carried by the patient at home, under the supervision of a dentist with carbamide 10-15% peroxide concentration or bleaching material can also be used naturally more secure by using Active Charcoal.[27] One active Charcoal capsules affixed on the toothpaste with a dose of a certain size and then brush your teeth for 2 minutes after it was left in contact with the tooth surface for 5 minutes.[8,9]

Figure 4. Active charcoal application on the surface of the tooth[9]

Working Mechanism of Active Charcoal as An Ingredient of Bleaching

Active charcoal is charcoal activated by way of chemistry or physics so it has high absorption carbon levels with varying. Surface active charcoal has been relatively free of deposits of hydrocarbons and is able to do because of surface adsorption and pores have been opened.[25] Because it has a very large surface area, then the activated carbon is suitable for applications that require extensive contacts in fields such as adsorption (absorption), the reactions and catalysis.[25]

Activated carbon is known as norit used to overcome digestive disorders. The working principle of norit is when it enters the stomach, the charcoal will be able to absorb the active ingredients harmful toxins that cause indigestion. Then in the pore surface of storage so that later came out along with the stool.[28] Same thing with teeth bleaching mechanism where one of the most important active charcoal as a specialist in cleaning the mouth is where active charcoal utilizing carbon element therein to brighten teeth color and evacuate plaque.[7,8,29]

The elements carbon (C) on the active charcoal able to absorb cations, anions, and molecules in the form of inorganic or organic compounds, either as a solution and as a

gas.[7,30] This is because the carbon atoms are covalently bonded in a hexagonal lattice similar to graphite.[30] Active Charcoal contained the substance of negative ion charge carbon that has the capacity to attract a positive Ionic charge of substance, such as insecticides, herbicides, chlorination of hydrocarbons, heavy metals ions, and phenol. Bond made his appeal and after that brought the substance coming out of the mouth.[30]

There are properties of the adsorbent (substance binding) in the active Charcoal so that it can lift the chromogen deposits on the teeth causing teeth to become whiter.[31]

Materials and Research Tools

The materials used in this research are: active Charcoal, Toothpaste, Saline Solution

Tools used in this study: Plastic filling instrument, Gloves, Mask, housing Pot, Disposable Syringe 3ml, Tweezers, Caliper, Measure out the spoon, Electric toothbrush, The Stopwatch, Vita Easyshade V, Electronic Balance Scale.

Figure 5. Vita EasyshadeV

Way of Working

1. specimen Preparation (dental enamel incisive 1 upper jaw), divided into three working groups with each group consisting of 10 specimens per treatment.
2. Sample preparation: a). Measure the thickness of the enamel of the tooth thickness and equate all specimens in each group prior to treatment, b). Active use of charcoal weigh electronic scale balance up to 100 mg.[10], c). Electronic toothbrush until the pressure measuring 300 to 400 n/m2. Optimal brushing power has been found between 300 to 400 n/m2 with consideration of brushing your teeth with a pressure of 300 to 400 n/m2 can enhance efficiency in the discharge plaque on tooth surfaces.[32], d). Prepare the toothpaste to use. Put a pea-sized toothpaste above toothbrush and flatten on the surface of a toothbrush, e). Toothpaste that has been flattened, dab the charcoal active 100 mg, f). Apply toothpaste that has been affixed to the active charcoal to the surface of the specimen by means of brushing and with minimal pressure and with small circular motion
3. Test Samples: a). the Specimens that have been applied to the active charcoal, on leave had occasional contact with active charcoal and labeled, to mark specimens of a group control, a group that had occasional contact with active charcoal for 10 minutes, 20 minutes and 30 minutes, b). Each container is closed and the stopwatch is turned on to indicate 10 minutes, 20 minutes, and 30 minutes, c). Specimens were left out of contact time, taken one by one from the container using the tweezers, rinsed with saline water.

After the sample is dry, then performed the measurement of color after exposure of active charcoal by using the VITA Easyshade Vuntuk assess the stability of the color of the sample.

Results

This research is experimental research laboratories by using a sample of the maxillary teeth incisive 1 contained gutap patchwork on the root canal. 30 fruit samples were divided into 3 groups, each group consists of 10 fruit incisive teeth samples 1 upper jaw contained gutap patchwork on the root canal. The Division of the sample group is done based on time variation of contact IE over 10 minutes, 20 minutes and 30 minutes.

Assumed each one time charcoal active is displayed on the surface of the enamel of the tooth takes time for 5 minutes. Active charcoal exposure done for 10 minutes (10 minutes ÷ 5 minutes) represents twice the exposure. Equivalent to 1 day of exposure in accordance with the frequency of brushing your teeth that

is 2 times a day. So the active charcoal of contact 20 minutes and 30 minutes each represent 2 and 3-day gear at let contact with active charcoal.[11]

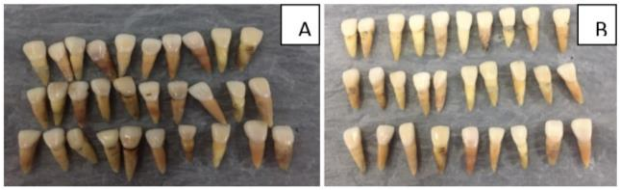

Figure 6. Change the color of the entire sample of incisive teeth of the upper jaw before the 1 (A) and after (B) exposure of active charcoal powder for 10 minutes, 20 minutes and 30 minutes.

The average value of the incisive teeth enamel discoloration 1 upper jaw contained gutap patchwork in the root canal after contact with active charcoal for 10 minutes, 20 minutes, 30 minutes and can be seen in (table 1).

Average	Color		
	Light	*Chrome*	*Hue*
After the 10-minute Brushing	14.1	16.14	-2.55
After Brushing 20 minutes	14.7	15.83	-2
After the 30-minute Brushing	20.02	10.76	-1.96

Table 1. The average values of the colors of the maxillary teeth incisive 1 contained gutap patchwork in the root canal after brushing with active charcoal.

Based on research results from a sample of maxillary teeth incisive 1 presented using active charcoal for 10 minutes, 20 minutes and 30 minutes obtained dental samples color 1 maxillary incisive experience color change. On the color of light has increased, in chromed color has increased and in color, the hue has increased.

To test the results statistically hypothesis, use spss program 22. Normality test performed against the data distribution of the results of research. Test results show samples of the normality of the distribution of data in the column Shapiro wilk – normal p > 0.05. (Table 2), With the following details.

	Sig.
Light After Exposure	.755*
Chrome After Exposure	.217*
Hue After Exposure	.367*

Table 2. Tooth enamel color sample Normality after exposure for 10 minutes. *Shapiro-Wilk, p>0.05

Test of normality incisive teeth color sample 1 upper jaw that had been presented by active charcoal for 10 minutes (table 2) of a normal distribution of the data obtained by p > 0.05 on a column for the value of the Shapiro wilk – light, chrome, and hue. It can be used to test the one way ANOVA because of the normal distribution of the data.

	Sig.
Light After Exposure	.301*
Chrome After Exposure	.718*
Hue After Exposure	.362*

Table 3. Tooth enamel color sample Normality after a 20-minute exposure. *Shapiro-Wilk, p > 0.05

Test of normality incisive teeth color sample 1 upper jaw that had been presented by active charcoal for 20 minutes (table 3) a normal distribution of the data obtained by p > 0.05 on a column for the value of the Shapiro wilk – light, chrome, and hue. It can be used to test the one way ANOVA because of the normal distribution of the data.

Test of normality incisive teeth color sample 1 upper jaw that had been presented by active charcoal for 30 minutes (table 4) of a normal distribution of the data obtained by p > 0.05 on a column for the value of the Shapiro Wilk – light, chrome, and hue. It can be used to test the one way ANOVA because of the normal distribution of the data.

Based on the average value of the incisive teeth color sample 1 upper jaw after exposure with active charcoal for 10 minutes, 20 minutes, 30 minutes and obtained samples of the incisive teeth of the maxilla 1 changes color (Figure 7).

	Sig.
Light After Exposure	.081*
Chrome After Exposure	.170*
Hue After Exposure	.432*

Table 4. tooth enamel color sample Normality after exposure for 30 minutes. Shapiro-Wilk, p > 0.05

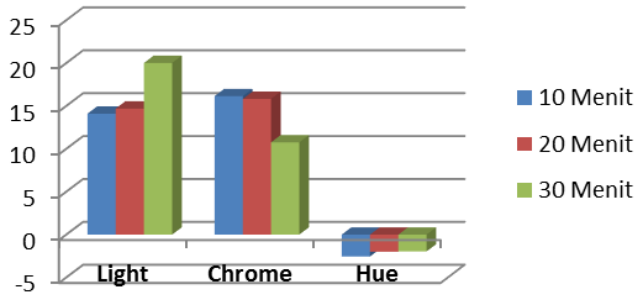

Figure 7. The graph of the average value of the incisive teeth enamels color sample 1 upper jaw after exposure with active charcoal for 10 minutes, 20 minutes and 30 minutes.

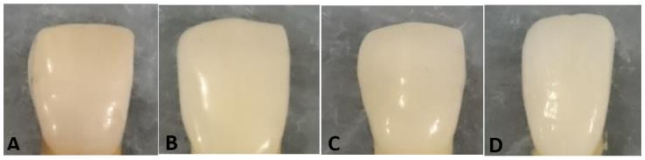

Figure 8. Discoloration of teeth incisive sample 1 of the maxilla. A, prior to exposure; B, after 10 minutes; C, after 20 minutes; D, after 30 minutes of exposure with active charcoal.

From the results obtained that the incisive teeth 1 upper jaw contained gutap patchwork in the root canal which has been presented with active charcoal for 10 minutes, 20 minutes and 30 minutes there is a color change. Seen from an increase in the value of light, chrome, and hue after exposure. It is likely caused by deposits of chromogen on a sample of teeth that are absorbed by the charcoal is active because of the nature of power absorbed (substance binding) in the active charcoal, so can affect the chemical bonding of dental samples and causes the occurrence of a change in color.

To test the sample teeth discoloration incisive 1 upper jaw that occurs on the third exposure groups with active charcoal for 10 minutes, 20 minutes and 30 minutes statistically, do a test of normality distribution against the results of the study data will be used.

Test of normality incisive teeth color sample 1 upper jaw after the exposure is done with active charcoal for 10 minutes, 20 minutes and 30 minutes of the normal distribution of the data obtained by $p > 0.05$ on a column for the value of the Shapiro Wilk – light, chrome, and hue After the exposure. It can be used for a parametric test that is one way ANOVA/one-way ANOVA because of a normal data distribution and homogeneous.

To test the incisive teeth discoloration 1 upper jaw that occurs on the third group of the exposure, the results obtained (table 5).

	Sig. (2-tailed)
Light After Exposure	.041*
Chrome After Exposure	.012*
Hue After Exposure	.831*

Table 5. one-way ANOVA test results. *One-way Anova Test, $p < 0.05$

ANOVA test results from one direction, demonstrate the value of light and chrome with p 0.05, then his conclusion < "there is a significant change in color on the light and chrome on tooth samples incisive 1 upper jaw after the exposure of the active charcoal between 10 minutes, 20 minutes and 30 minutes". These results correspond to the initial hypothesis, caused by deposits of chromogen on a sample of teeth that are absorbed by the charcoal is active because of the nature of power absorbed (substance binding) in the active charcoal, so can affect the chemical bonding of dental samples and lead to a change in color.

ANOVA test results from one direction, demonstrate the value of hue with $p > 0.05$, then the conclusion "there is no significant change in color on the light and chrome on tooth samples incisive 1 upper jaw after the exposure of the active charcoal between 10 minutes, 20 minutes and 30 minutes". These results do not correspond to the initial hypothesis, caused by deposits of chromogen on a sample of teeth that are absorbed by the charcoal is active because of the nature of power absorbed (substance binding) in the active charcoal, so not so affect the chemical bonds of the sample teeth.

To know the exposure time of the groups that are experiencing significant color change among the three exposure groups, then continued with the Post Hoc test LSD (table 6). From the results of the test show the LSD 0.05 value p < light exposure time of 10 minutes to 20 minutes, and the exposure time from 20 minutes to 30 minutes. Whereas, from the results of the test show the LSD 0.05 value p < chrome exposure time of 10 minutes to 30 minutes, and the exposure time from 20 minutes to 30 minutes.

	Sig.
The difference in average Light After exposure to 10 minutes and 20 minutes	.036*
The difference in average Light Exposure After 20 minutes and 30 seconds	.022*
The average difference in Chrome After exposure to 10 minutes and 30 seconds	.007*
The average difference in Chrome After exposure to 20 minutes and 30 seconds	.011*

Table 6. follow-up test result of LSD. *The average Difference significant at p <0.05

Hence this research "there is a significant change in color on the sample values for the incisive teeth light 1 the upper jaw between the exposure time of 10 minutes to 20 minutes, and the exposure time between 20 minutes to 30 minutes". These results correspond to the initial hypothesis, caused by deposits of chromogen on a sample of teeth that are absorbed by the charcoal is active because of the nature of power absorbed (substance binding) in the active charcoal, so can affect the chemical bonding of dental samples and lead to a change in color.

From the results of testing LSD also showed a p-value of 0.05 < chrome exposure time from 10 minutes to 30 minutes, and the exposure time from 20 minutes to 30 minutes. Then the conclusion is "there is a significant change in color on the sample values for the incisive teeth chrome 1 upper jaw between the exposure time of 10 minutes to 30 minutes and the exposure time between 20 minutes to 30 minutes".

The results also showed "there is a significant change in color on the light and chrome sample teeth incisive 1 upper jaw after exposure with active charcoal for 30 minutes". These results correspond to the initial hypothesis, as caused by deposits of chromogen on a sample of teeth that are absorbed by the charcoal is active because of the nature of power absorbed (substance binding) in the active charcoal, so can affect the chemical bonding of dental samples and lead to a change in color.

Discussion

One way ANOVA test results for the presence of the influence of time of exposure of active charcoal to changes the color of the enamel of the teeth on the Group I with preferential treatment in the form of a natural teeth whitening ingredient application i.e. active charcoal obtained p-value of 0.05, groups < II the form of treatment with application of natural teeth Whitener ingredients namely active charcoal with p-value of 0.05, and group < III with preferential treatment in the form of a natural teeth whitening ingredient application i.e. active charcoal with p-value of 0.05, then < can be concluded that there the influence of exposure time on active charcoal to changes the color of the enamel of the teeth that are very significant. The data obtained can be known to occur the discoloration of the enamel become whiter in a natural teeth whitening ingredients namely active charcoal described in the surface of the tooth with longer periods of time.[8,9]

Science and technology will increasingly experience natural bleaching material progress, dental bleaching that can produce color in solution or surface is an organic compound with a long chain of conjugation, either in the form of a single bond as well as a duplicate. These materials contain heteroatoms, Carbonyl, and phenyl ring in the conjugation and are often referred to as kromofor. Bleaching and dekolorasi kromofor can occur through the destruction of one or more double bonds in the chains of conjugation, by cutting the chains of conjugation, or by oxidizing molecules in a chain of other chemical conjugation.

Active Charcoal oxidize various varieties of organic compounds or inorganic. This reaction mechanism varies depending on the substrate, the reaction environment, and catalysis.[7,20,33] In General, the bleaching mechanism with active charcoal could not be known with certainty. Active Charcoal, when described in chemical elements, contain water 5-15%, 2-3% grey and the rest made up of carbon. Active Charcoal amorphous shape consists of a flat-plate-plate, compiled by the C atoms covalently bonded in a hexagonal lattice with one atom C at any angle. The plates these plates-reams of one another forming crystals

with residual hydrocarbons, and other organic compounds that are left on the surface.[34]

an Active Charcoal is solid porous material that is the result of burning material containing carbon. Charcoal is a form of active charcoal has been through activation by using CO2 gas, moisture or chemicals so the pores open and thus absorption power became higher zat color and smell.[34]

Active Charcoal will be one of the best materials for cleaning teeth and dental bleaching in the world. This is the result of a negative ion charge of the substance has the capacity to attract positive Ionic charge of substance, such as deposits chromogen in the surface of the teeth such as nicotine, pigmentation of the food or drinks (coffee, tea, wine), tar, or Chlorhexidine staining caused by bonding of the antiseptic action with anion surface of teeth. Active Charcoal makes appeal bonds and after that brought the substance coming out of the mouth and the body. So, when the active charcoal of tooth surface exposed led to adsorb high power produced by active charcoal to absorb the deposits of chromogen and other factors in the enamel of the tooth discoloration, so can influence of chemical bonding on teeth and cause the occurrence of a change in color.[7]

Active Charcoal Atomic bonds containing negative ions entering through the intermediary of the enamel and oxidizes the dentin tubuli to pigment on the color of the teeth, causing the dentin becomes brighter. Ions contained in active charcoal can be freely entered through the enamel and dentin due to porosity and permeability structure of both. Freely transfer occurred because the molecular weight of the active charcoal of relatively lower i.e. 12.0107 g/mol as well as have the ability to protein denaturation may increase the movement of ions through the teeth.[35] Charcoal is an active substance that has the ability to penetrate through the enamel and dentin exposed to coloring since charcoal is active adsorbent, is a porous solid adsorbent which is largely made up of the elements carbon and each covalently bonded.[34]

Thus, surface active Charcoal is nonpolar. In addition to composition and polarity, the porous structure is also a factor that is worthy of note. The pore structure is related to the surface area, the smaller the pore of active charcoal, resulting in the greater surface area. Thus the speed increased adsorption properties of active charcoal is the most important is the absorbance. The process of adsorption occurs only on the surface, do not enter in the bulk phase. Adsorption process primarily occur at the micropore (small pores), while the transfer of adsorbate from the outer surface to the surface of the micropore is makropori.[34]

Chemical adsorption occurs due to a chemical bond formed between the molecular adsorbent surface with the adsorbent. Chemical bonds can be either ionic or Covalent bonds. The bonds that are formed very strong so that the original species could not be found. This chemical adsorption preceded by physical adsorption where adsorbate approached the surface of the adsorbent via Van der Waals forces or hydrogen bonding was followed by chemical adsorption. On chemical adsorption, adsorbent attached to the surface by forming chemical bonds are usually a covalent bond.[36]

According to Omidvari, a molecule adsorbat was detained on the surface of the adsorbent by Valence type equals that occurs between atoms in molecules. Chemical adsorption is usually used for the determination of the central area of the surface reaction kinetics and active.[37,38] Teeth bleaching occurrence is caused by the presence of adsorption reactions. Adsorption power has the ability to pull the molecules of a substance through a chemical reaction, color, so the colors become neutral and lead to the occurrence of the whitening effect.[39]

Lack of active charcoal is active charcoal has a high absorption capacity.[8,9] Thus, the active charcoal cannot know the substance in need of body and substance is not in need of the body, when the body is exposed to the oral cavity or with active charcoal note that active charcoal has a tendency to absorb all kinds of substances, microorganisms, bacteria from the body are not required until the required body, will even tie a number of vitamins in the body. This is because the nature of adsorbent (binding substances) derived from a form of microcrystalline graphite and non-porous structure which has been processed to develop its internal porosity.[8]

On the research of changes of dental enamel color sample incisive 1 upper jaw which applicated using active charcoal for 10 minutes, 20 minutes and 30 minutes with an increasingly white color. Long contact between teeth and active charcoal, is directly proportional to the change in colour.[8,9]

From the research that has been performed, the obtained results that active charcoal can affect changes in dental enamel incisive sample 1 of the maxilla are presented for 10 minutes, 20 minutes and 30 minutes. It is evident that there is a change in the value of light and chrome are significant and cause tooth enamel color incisive 1 upper jaw became more white or bright.

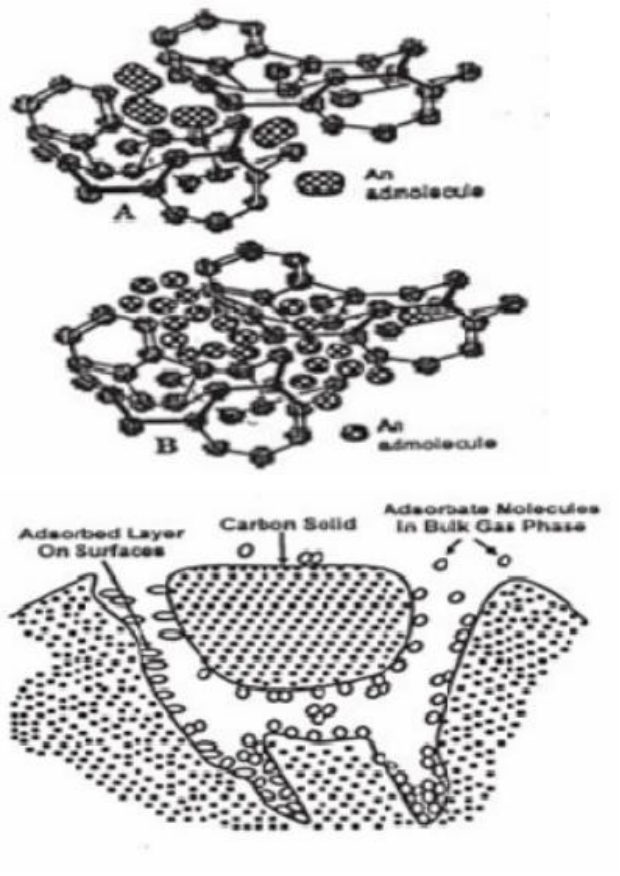

Figure 9. the process of Adsorption on activated carbon Molecular Adsorbent: Transfer to the Adsorbent[34]

Conclusions

Color changes can occur due to a process of negative ion charge carbon substance which has the capacity to attract a positive Ionic charge of substance. Active Charcoal is presented on the surface of a tooth led to adsorb high power. Active Charcoal used to absorb deposits of chromogen and other factors in the enamel of the tooth discoloration, thus affecting the chemical bonds in the teeth and lead to the occurrence of a change of color. The decrease in the value of the light and the rising value of chrome significantly on the incisive teeth of the maxilla 1 presented with active charcoal for 10 minutes, 20 minutes and 30 minutes. This indicates the presence of teeth enamel discoloration represents brushing using active charcoal and in contact with the tooth surface of the let.

Conflict of Interest

The authors state that there were no conflicts of interest related to this study.

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