PRODUCTION OF BLACK SHOE POLISH USING SPENT CARBON BLACK PHOTOCOPIER TONNER.

BY

ABDULRAHEEM ABDULLAHI

REG: 2005/21683EH

PRESENTED TO

THE DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA.

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THIS PROJECT IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR DEGREE IN ENGINEERING.

JANUARY, 2010

DECLARATION

I hereby declare that this project work is my original work and no body has done it for me elsewhere.

_____ _____

Abdulraheem Abdullahi **Date**

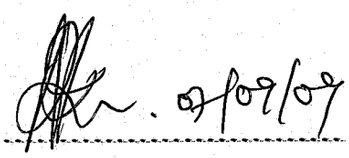
APPROVAL PAGE

This is certify that this project is an original work undertaken by **ABDULRAHEEM ABDULLAHI, 2005/21683EH** and has been prepared in accordance with the regulation governing the preparation and presentation of projects in federal university of technology minna.

03/09/2009

Eng. Mohammed .U. Garba — Date

Project supervisor



09/09/09

Eng. M. Alhassan — Date

(Ag. H.O.D)

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EXTERNAL EXAMINER — Date

DEDICATION

dedicated this project to Almighty Allah and my parent Alhaji B.A. Abdulraheem and Late Hajiya. R.M. Abdulraheem.

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First and foremost, my sincere gratitude goes to Almighty Allah who gave me the ability, knowledge and health to undergo this research work successfully. I wish to express my tremendous gratitude to my parent, Alhaji and Late Hajiya B. A. ABDULRAHEEM and also ma beloved Uncle Alhaji Babatunde Abdulraheem for been there to meet my moral and financial needs.

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ABSTRACT

The aim of this research project is to produce black shoe polish using carbon black from waste photocopier tonner. A blend of 100 g of paraffin wax was melted at 80 °C 3g stearic acid was dissolved in 5om\s of distilled water. the solution of stearic acid was added to the melted paraffin wax and heated on the heating mantle to 78 °C, 2 g of carbon black was added to a solution of stearic acid and then added to the mixture on the heating `mantle and stirred gently to attain uniform mixture. Paraffin oil and petroleum jelly was finally added to the resulting mixture and finally returned back to the heating mantle for relieving to about 48°C. resultant mixture was kept under an air- conditional to cool and finally poured into an empty shoe polish can and finally kept to cool further to attain ambient temperature. It was observed that the shoe polish produced in the research work was as qualitative as that manufacture by the standard once (kiwi brand) which gave a better water resistant surface appearance and nourishment.

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CHAPTER ONE

1.0 Introduction

Shoe polish (or boot polish), usually a waxy paste or a cream, is a consumer product used to shine, water proof and restore the appearance of the leather shoe or boot, thereby extending the foot wear life. The chemical industries are responsible for the manufacture of these shoe polish because of its high demand in the area where it is really needed especially in the military circle (A. Davidson, 1968).

By the term "shoe polish" we intend a pasty mature forming a polish composition of one or more different waxes and oil of turpentine, paraffin oil, petroleum jelly and carbon black. These shoe polish composition may be applied easily and after a brief polishing with brush or cloth, a hard, water resistant high polish is obtained on the shoe or boot. The solvent content of the shoe cream makes possible a quick cleaning of spots dirt and discoloration of all kinds.(A. Davidson, 1968)

The shoe polish with its soft wax components, dissolved in the solvent, penetrates into the leather and produces a type of secondary lubrication, which is necessary for the relation of the flexibility of the leather. After application, the solvent evaporates then remains a protective, water repellent layer of wax on the surface of the leather which after polishing, results in a highly lustrous but thin film. Another advantage of the composition is their temperature stability and the prevention of the exuding of the petroleum solvent (paraffin oil) during deposition of the cream in the leather.

Included among the waxes frequently used in shoe polish recipes are the nature waxes such as carnauba, esparto, bees war, and shellac waxes, as well as the lignite wax, originating from lignite and its partly synthetic finishing products further more, filly synthetic waxes, such as polyethene wax and paraffin are from the **Fischer Tropsch Synthesis.** The choice of which one of use is a matter within the scope of the skilled worker.(A .Davidson,1968).

Base on the previous work done on the production of shoe polish (kiwi), Ingredients used includes: Naphta, lanolin,turpentine,wax(often carnauba wax) ,gum Arabic, ethylene glycol, and if required a colorants, such as azo dye (such as aniline yellow).It typically has a specific gravity of 0.8, is negligible soluble in water, and is made of between 65 and 77% volatile substance usually naphtha. The high amount of volatile substance means that the shoe polish will be harden after application, while retaining. Kanolin, a hydrophilic grease from wool-bearing animals such as sheep or goat, acts as both a waterproofing wax and a bonding agent, giving the shoe polish its greasy feel and texture. It prevents the naphtha from evaporating until the polish has been spread and buffed into a thin film on the leather surface.(www.diydoctor.org.uk)

1.1 Aim and Objectives

The aim of this project is to produce black shoe polish via the following objectives:

- Production of shoe polish using carbon black from spent photocopier tonner with high quality an water resistance.
- Comparison of product with standards.

1.2 Scope

The project describes how black shoe polish is produced using carbon black from photocopier tonner.

Black shoe polish is produced from different classes of waxes dissolved in solvents. The raw materials required are paraffin wax, paraffin oil, carbon black from photocopier tonner, petroleum jelly, distilled water, stearic acid. The equipment required includes: Stainless steel vessel, electric heater (hearting mantle), air conditioner, thermometer, weighing scale e.t.c. for the coloration of the shoe polish , fat soluble dyes, especially carbon black are used. The carbon black is not a sufficiently soluble base in waxes and

solvents. Therefore, they must be modified with fatty acid, or example stearic monatomic acid. The carbon black is obtained from the photocopier after usage, collected as waste.

The photocopier tonner made of many different types of thermoplastic polymers including acrylics polyamides, hydrocarbon resin. The major raw materials off the photocopier tonner are;Carbon black, nigrosine, copper oxide e.t.c.

Carbon black are pigments of extremely fine particle size with color varying from every mass tone with brown under tone, depending on the method of manufacturing, they are chemically merit, extremely pest to heat. (Kirk Othmer, 1970).

CHAPTER TWO

2.0 BACKGROUND THEORY

2.1 History of Shoe Polish Before The Twenty Century

Since medieval times, dubbin, a waxy product was used to soften and water proof leather, however, it did not impact shine. It was made from natural wax, oil and tallow. As leather with a high natural veneer because popular in the eighteenth century, a high glassy finish became important, particularly on shoes and boots. (www.kiwiphile.org/sep2000.html).

In most cases, a variety of home made polishes were used to provide this finish, often with lanolin or bee wax as a base.

In the nineteenth century, many forms of shoe polish became available, non were rarely referred to as shoe polish or boot polish. Instead, they were often called blacking (especially when mixed lamp black), or simply continued to be referred to as dubbin.

Tallow, an animal by product, was used to manufacture a simple form of shoe polish at this time.

Chicago, were 82 % of the meet consumed with United States was processed, became a major shoe polish producing area for this reason.

Prior to 1906, shoe polish was not well known as a purchasable product, nor was it particularly sophisticated. Whale sales were not especially high, a few brands, nugget, were available in England during the 1800s. The practice of shining peoples shoe gradually caught on and soon many shoeshine boys in the city streets were offering shoe shines using basic form of shoe polish along with a polishing cloth. (www.kiwiphile.org)

2.2 Modern Day Shoe Polish

While a number of order leather preserving products existed (including the Irish brand punch, which was first made in 1851, and the German brand, Erdal, which went on sale

in 1901), the first shoe polish to resemble the modern varieties (aimed primarily at inducing shine) was kiwi. Scottish expatriates.

Williams Sam say and Hamilton McKellar began making "boot polish in small factory. (Melbo bourne, 1904). Their formula was a major improvement against previous brands. It preserved shoe leather, made I shine and restored colour.

By this time Kiwi dark polish was released in 1908, it incorporated agents that added suppleness and water resistance. Australian made boot polish was then covered the world best. Black and a range of colours became available and exported to Britain, continental Europe and New Zealand began.

He named the shoe polish after kiwi, the national bird of New Zealand, Ramsay wife, Annie Elizabeth meek Ramsay, was a native of Omarun New Zealand.

It has been suggested that, at time when several symbols were weekly associated with New Zealand, the eventual spread of kiwi shoe polish around the world enhanced the kiwi popular and promoted at the expanse of the others. Kiwi remains the predominant shoe polish brand in most of the world, begin sold in over 180 countries and holding a 53% market share world wide. Today it is manufactured in Australia, Canada, France, India, Pakistan, South Africa, Spain, the United Kingdom and the United States.

Kiwi was acquired by the American company following its purchases of Reckitt and Colman in 1991 and Knomark in 1987. the federal trade commission ruled that Sara Lee had to divest it owner ship of these companies in 1994 to prevent it from becoming a monopoly since this ruling, Sara Lee has been prevented from acquiring any further assets or forms associates with chemical hoe care products in the united state without prior commission approval, (www.competion-commission.org.).

2.3.0 Wax

The term wax is used very broadly and is applied to a wide variety of materials both as components and as finished of preparations. The materials either have properties resembling certain well – known materials that provide physical performances similar to these associated with function used of wax, such as filling, sealing, polishing cold making e.t.c

Waxes are used in many industries with variety of applications such as paper coating polishes, electrical insulation, carbon paper textiles, leather, pharmaceutical e.t.c.

There are many other chemical structures also that are common in waxes and long – chain hydrocarbon compounds are particularly impactant in the mineral wax classification. Chemically waxes are esters of fatty acids and monohydric fatty alcohols. Physically waxes are water repellent solids having useful of plastic characteristics. Waxes are widely distributed in nature with commercial important representatives in each of the following classification. The there major e.g. Carnauba wax, sugar cane wax, Animal wax bees wax, shellac wax and hydrocarbon wax, Among all three types of waxes being mentioned bee wax has been without doubt most important of all waxes during the past centuries, but carnauba war is one of the most important raw materials for a wax function presently for shoe polish.

Since Carnauba was not readily available all over the world, bee wax is readily available to be used.

According to Williams, 2002, wax is generally refers to as a substance that is plastic solid at ambient temperature and on being subjected to moderately elevated temperatures it becomes a low viscosity liquid. Because it is plastic, wax usually deforms under pressure without the application of heat. The chemical composition of waxes is complex: they usually contain a broad variety of molecular weight species and reaction functional

groups, although some classes of mineral and synthetic waxes are totally hydrocarbon compounds.

2.3.1 TYPES OF WAXES

2.3.1.1 Animal Wax (Bee Wax)

Bee wax is a product from a bee has Bee wax is created by young honey bees of a certain age. Sales are produced by glands of 12 to 17 day old worker bees on the ventral stomach surface of the abdomen. Worker bees have eight wax producing glades on the inner sides of the ventral side of each segments of the body. Wax is produced from abdominal segments.

The size of these wax glands depends on the age of the worker.

Western honey bees use the bees wax to build honey comb cells in which their young are raised and honey and pollen grain are stored. For the wax making bees to secrete wax, the ambient temperature in the hive has to be 33 to 36 °C (91 to 97 ° F). To produce then wax, bee must consume about eighteen times as mush honey by wax. Estimates are that bee fly 156,000 miles to yield pound of bee wax (530,00 km/kg).

When bee keepers extract the honey they cut off the wax caps from each honey comb coil with an uncapping knife of machines. Its colours varies from nearly while to brownish but often a shade of yellow, depending on purity and the type of flower gathered by the bees.

Wax from the brood combs of the honey bees hive tends to be darker than wax from the honey comb.

Impunities accumulate more quickly in the brood comb. Due to the impunities, the wax has to be rendered before further use. The wax many further be deified by heating in water and may than be used for candles or as a lubricant for drawers and windows or as a wood polish. As with petroleum waxes it may be softened by dilution with vegetable oil to make it more workable at room temperature, hence it may be used to create sculpture

and every models for use in the lost wax casting process.(T.p Hildich,(1949),industrial chemistry of fat and waxes,1st edition). Beeswax – white and yellow bee wax have been known for over 2000 years Beeswax is secreted by bees. E.g. Apis mellifera, A.dorsata, A.flores, and A.indica, and used to construct the combs in which bees store their honey. The wax is harvest by removing the honey and melting the comb in boiling water; the melted product is filtered and cast into cakes. The yellow beeswax can be bleached with oxidizing agent, e.g. peroxide or sunlight, to white beeswax, a product much favored in candle wax production. Beeswax is naturally aromatic, so it is rare that one would add fragrance. (T.p hildich,1949).

2.3.1.2 Vegetable Wax (Carnauba Wax)

The aerial surfaces of utmost all multicellular plants are covered by a layer of wax. With the advent of more sensitive analytical tools, e.g. gas-liquid chromatography and mass spectrometry, investigations of the character of a particular wax many species has been undertaken. However, only a very few extent species, primarily those in semiarid climates, produce waxes in such quantities that commercial recovery is economically feasible.

Vegetable Waxes include Candelilla, Carnauba, Japan wax, Ouricury wax, Douglas-Firbark wax, Rico-Barn wax, Castor wax, Bayberry wax, and Jojoba wax.

Carnauba wax is a derived from the leaves of a plant native to north eastern Brazil, the carnauba palm (copernicaprufera). It is known as "given of waxes" usually comes in the form of hard yellow – brown flakes. It is obtained from the leaves of carnauba palm by collecting them, beat them to loosen the wax, then refining and bleaching the wax.

Carnauba wax can produce a glossy finish and as such is used in automobile waxes, shoe polishes, food products such as candy corn, and floor and furniture polishes.

Carnauba wax cooled on the surface of the lea, i.e cuticle. Leaves of this fan palm are removed individually from the tree, cut and shielded and them dried, so that wax flakes

off. A pound of carnauba wax is obtained from about 20 leaves. This powder is melted, strained and then molded into blocks to be shipped to manufacturing countries. The tree exudes a wax through the equatorial climate. The cutting of the leaves and sprouts takes place during the dry months of September through February. Workers use knives to trim the leave from nature trees. The color and quality of the wax are government by the leaves and care used in processing of this hard, brittle, lustrous wax.

Kiwi black shoe polish polish is made with imparted carnauba wax and a bland of other fine material to stain, waterproof, nourish and shine all leathers. It meeting point is 78 – 85 °C, among the highest of natural waxes. Its relative density is about 0.97. It is among the hardest of natural waxes being harder than concrete in its pure form. It is practical in soluble in water, soluble on heating in ethyl acetate, poetically in soluble ethyl alcohol.(T .p Hildich,1949)

2.3.1.3 Hydrocarbon Wax (Paraffin Wax)

Paraffin is a common name for a group of alkenes hydrocarbon with the general formula CnHn + 2, where n is the number of carbon atoms. The simplest paraffin molecule is that of methane, CH4, a gas at room temperature.

Heavier members, such as that of octane C8H18, appear as liquids at room temperature. The solid forms of paraffin, called paraffin wax, are from the heaviest molecules. Paraffin wax was identified car/ Reichen back in 1830.

Paraffin, or paraffin hydrocarbon, is also the technical name for an alkane in, general, but in most cases refers specially to a lineer, or normal alkane – where as branched or ISO – alkanes are also called ISO paraffin. It is district from the fuel know in Britain as paraffin oil or first paraffin, which is called kerosene in American English. Usage of the term varies in other countries, leading to confusion about which substances is being

referred to paraffin wax. The name oil divided from the Latin Parum (= barely) +affain with the meaning here or " lacking reactivity").

It is mostly found as a white, Odorless, tasteless mainly solid with a typically meeting point between about 47 °C and 64 °C it is insoluble in water, but soluble in either benzene, and certain esters. Paraffin is unaffected by most common chemical reagents, but burns reality.

Pure paraffin wax is an extremely good electrical resistively of between 10^{13} and 10^{17} ohm meter.

This is better than nearly all other materials except some plastics. It is an effectively mention moderator and was used in James Chadwick's 1932 experiments to identify the mention.

For casting of metals "investment casing waxes" are used, in which the paraffin wax is combined with several other materials to obtain the desired properties. Paraffin wax is not much used to make original models for casing, as it is relatively brittle at room temperature and usually cannot be cold carved without excessive chipping and breaking of pliable waxes such as bees wax are preferred for this purpose. Paraffin wax (25 H 52) is an excellent material to heat, and has a typically heat capacity of 25003/ (kgk) and heat fission of 200 kg/ kg to 220 kg / kg.

In industrial uses it is often useful to modify the crystal properties of the paraffin wax, typically by adding, branching to the existing carbon back bone chain.

The modification is usually done with additives, such as forms of polyanlylene.

Liquid paraffin a mixture of heavier alkanes has a number of names, including adepsine oil, alboline, glymol, medicine, paraffin, USP, mineral oil. It is often used in infrared spectroscopy, as it has a relatively uncomplicated. Infrared spectrum. When the simple to be tested is made into a null (a very thick solution), liquid paraffin is added so ,it can spread on the disks to be tested liquid paraffin 9medicine) is used to aid bowel

movement in persons suffering chronic constipation, it passes through the alimentary canal without used of being taken into the body, but ,it limits the amount of water removed from the stool. .(T.p Hildich,1949)

2.3.1.4 Chemical Composition and Properties of Waxes

McGraw Hill, 1982, said the most typical chemical constituent of natural waxes as a group is the esters of long-chain fatty alcohols and acids. Petroleum waxes and certain other mineral waxes, however consists of hydrocarbons. Aliphatic or open chain structures with relatively little branching or side chains can be considered typical for both ester and hydrocarbon waxes. It could be said that the functional element found in waxes are carbon, hydrogen, and oxygen.

Other compound that could be found in waxes are hydrocarbon, alkyl, esters, primary alcohols, acids, ketones, aldehyde, secondary alcohols, hydroxyl acids, lactones, acetols diols, dicarbonxylic acids, do-ketones, polyester etc.

2.4.0 TYPES OF SOLVENT USED

2.4.1 Stearic Acid

Stearic acid (IUPAC systematic name: octadecanoic0 is one of the useful type of saturated fatty aid) is me of the useful types of saturated fatty acids that comes from m any animal and vegetable fats and oils. It is chemical formula is CH3 (CH2) 16 COOH. It s names comes from the Greek word stear (genitive steatos), which means tallow. The tern steatos is applied to the salts and esters of stearic acid.

Stearic acid is prepared by treating animal fat with water at a high pressure and temperature, leading to the hydrolysis triglycerides it can also be obtained from the hydrogenation of some unsaturated vegetable outs, common stearic acid is actually a mix of stearic acid and palmitic acid, although purified streaic acid is available separately.

Stearic acid is useful as an ingredient in making candles, soaps, plastics, oil pastels and cosmetics, and for softening rubber, stearic acid is used to harden soaps, particularly those made with vegetable oil.

Stearic acid is also use as parting compound when making plaster castings from a plaster piece mold or waste mold and when making the mold from a original day. In this use, powdered streaic acid is dissolved in water and the solution is brushed on to the surface to be parted after casting. Esters of stearic acid with ethylene glycol, glycols striate and glycol dissertate are mused to produce effect in shampoos, soaps and other cosmetic product. They re added to the product in mother form and allowed to crystallize under controlled conditions stearic acid under goes the typical reactions of unsaturated carboxylic acids, reduction of stearic alcohol and estarification with a range of alcohol.

Nicore Leoeuf –Little,2002, reported that stearic acid which is also known as stearin, is a long-chain fatty acid often used in making shoe polish and candles. Its primary property is to raise the melting point of the wax mixture, making them harder and more durable.

The derivation of stearin from rendered animal fat aided the industry's transition from tallow to paraffin. Paraffin became popular because it cost less to produce and burned cleaner than tallow. However, it's lower melting point-between 120 and 140 degrees Fahrenheit –caused problems. The hardening effect of stearin, with its melting point of up to 160 degrees Fahrenheit, made paraffin a much more viable option.

Dada, 2007, said Stearin powder can usually be found in the same stores that sell paraffin and bees wax. It can also be made from vegetable oil, coconut, and as from tallow, so it is now reliant on individual choice and substantial factors to prefer to circumvent animal by product and it will take benefit of this useful additives.

2.4.2 Paraffin Oil

Paraffin oil was first distilled by geologists Abraham Gesner in 1907 in New Brunswick, Canada, from a type of asphalt called Albertite. As the 19th century progressed, new sources of paraffin oil were discovered, and its production became more commercialized and widespread. Gesner founded the kerosene gaslight company in 1850, and the following year, Scottish chemist James Young began distilling paraffin oil from local Torbanite coal. In 1856, Polish chemist Ignacy Lukasiewicz discovered an ever cheaper method of refining paraffin oil. The low prices and availability of the new fuel led to the decline of the whaling industry throughout the latter half of the 19th century.

Before the advent of electric battery power, paraffin oil was the most common fuel for lamps and portable lanterns. It is still used to some extent for portable lamps and stoves, most often by campers or in developing countries. The Amish, who are religiously opposed to electrical power, heavily rely on paraffin oil is to power their lamps and appliances. Paraffin oil is most often used in the modern world as fuel for jet planes and rockets.

Paraffin oil has also been used as an industrial solvent and lubricant. It can be used to store substances that may be damaged by or volatile in the resent of oxygen. Historically, paraffin oil has been added to standing water to prevent mosquitoes from breeding and applied to the head to kill lice, though these practices can be dangerous and have mostly fallen out of use. Paraffin oil is also used in some forms of entertainment, such as fire dancing and fire breathing, as it ignites at a relatively lower temperature than other fuels. Paraffin oil, known as kerosene in Australia and the United States and stove oil in Canada, is an inflammable liquid hydrocarbon burned as fuel. It is most commonly used to power jet engines for aircraft, but can also be used for heating, lighting and cooking. Paraffin oil is refined from petroleum and is relatively cheap to produce.

Kerosene or paraffin oil is a flammable hydrocarbon liquid its heating value, or heat of combustion, is around 18,500 Btu/Ib, or 43.1 MJ/Kgm making it similar to that of diesel. It is widely used to power Jet – engine air craft but is also commonly used as a leading fuel.

Kerosene is a thin, clear liquid formed from hydrocarbons. Kerosene is obtained from the fractional distillation of petroleum between 15 °C and 275 °C, resulting in a mixture of carbon chain containing 12 to 15 carbon atoms.

In 1807, kerosene was refined from a naturally occurring asphaltic called paraffin oil because of its source from natural gas.

2.4.3 Oleic Acid

There is a fatty acid which is refined by distillation. The raw material used in this production are low – grade fats such as bone and skin grease low grade tallow, low grade vegetable outs e.t.c. these fatty acid is used in the manufacture of shoe.

Shoe polish is mainly for the preparation of color solution of carbon black.

2.4.4 Naphtha

It is a petroleum fraction used as solvent in shoe polish formulation to prevent "skinning" in wax polish.Naphtha has a characteristic aromatic color, which is usually predominant in the shoe polish produced. It is used in place of turpentine (which is the most vilely used solvent for shoe polish formulation).

There are two types of naphtha available, they are light and heavy naphtha.

2.4.5 Benzene

Benzene is a petroleum fraction slightly higher than kerosene. It is a volatile, inflammable with a characteristic aromatic odor. It is an excellent solvent for a variety of organic compounds. In shoe polish formulation, it is used as a solvent for wax.

2.5.0 Carbon Black

For the coloration of the shoe polish, fat – soluble especially carbon black is used. The carbon – black are not sufficiently soluble as free bases in waxes and solvents. Therefore, they must be modified with fatty acids, for example stearic acid, the carbon black is obtained from the photocopier which has an economical usage because it is collected as waste.

Carbon black are pigment of extremely fine particle size, with color varying from grey mass tone with blue under tone to a dense jet black mass tone with brown under tone depending on the method of manufacturing. They are chemically merit, extremely fast to heat.

Carbon black is a material produced by the incomplete combustion of heavy petroleum products such as FCC tar, coal tar, ethylene cracking tar, and a small amount from vegetable oil. Carbon black is a form of amorphous carbon that has a high surface area to volume ration, although it surface area to volume ratio is low compared to activated carbon. It is dissimilar to soot because of its much higher ratio and significantly less (negligible and bioavailable) PAH content. Carbon black is used as a pigment and reinforcement in rubber and plastic products.

The current international agency for research on cancer (IARC) evaluation is that, carbon black is possible carcinogenic to humans (group 2B)". Short – term exposure to high concentrations of carbon black dust may product discomfort to the upper respiratory tract, through mechanical irritation.

2.5.1 Common Uses

The most common use (70 %) of carbon black is as a pigment and reinforcing phase in automobile tires. Carbon black also helps conduct heat away from the tread and belt area of the tire, reducing thermal damage and increasing tire life. Carbon black particles are also employed in some radar absorbent materials and in photocopier and laser printer toner.

Total production was around 8, 100, 000 metric tones (8,930,000 short tons) in 2006. About 20 % of world production goes into belts, hoses and other non – tire rubber goods. The balance is mainly used as a pigment in inks, coatings and plastics. For example, it is added to polypropylene because it absorbs ultraviolet radiation, which causes the material to degrade.

Carbon black from vegetable origin I s used as a food coloring, in Europe known as additive E153.

2.5.2 Reinforcing Carbon Blacks

The highest volume use of carbon black is as reinforcing filler in rubber products, especially tires. While a pure gum vulcanizate of styrenebutadiene as a tensile strength of no more than 2.5 MPa, and almost nonexistent abrasion resistance, compounding it with 50 % of its weight of carbon black improves its tensile strength and wear resistance.

Practically all rubber products where tensile and abrasion wear properties are crucial use carbon black, so they are black in color. Where physical properties are important but colours other than black are desired, such as white tennis shoes, precipitated or fumed silica is a decent competitor to carbon black in reinforcing ability. Silica – based fillers are also gaining market share in automotive tires because they provide better trade – off for fuel efficiency and wet handling due to a lower rolling loss com carbon black – filled

tires. Traditionally silica fillers had worse abrasion wear properties, but the technology has gradually improved to where they can match carbon black abrasion performance.

2.5.3 Pigment

Carbon black (colour index international, PBL – 7) is the name of a common black pigment, traditionally produced from charring organic materials such as wood or bone. It consists of pure elemental carbon, and it appear black because it reflects almost no light in the visible part of the spectrum. It is known by a variety of names, each of which reflects a traditional method for producing carbon black:

- Ivory black was traditionally produced by charring ivory or bones
- Vine black was traditionally produced by charring
- Lamp black was traditionally produced by collecting soot, also known as lampblack, from oil lamps

Newer methods of producing carbon black have superseded these traditional sources, although some materials are still produced using traditional methods. For artisanal purposes, it is very useful.

2.5.4 Surface Chemistry

All carbon blacks have chemisorbed oxygen complexes (i.e., carboxylic, quinonic, lactonic, phenolicgroups and others) on their surfaces to varying degrees depending on the conditions of manufacture. These surface oxygen groups are collectively referred to as volatile content. It is also known to be a non conductive material due to its volatile content.

The coatings and inks industries prefer grades of carbon black that are acid oxidized. Acid is sprayed in high temperature dryers during the manufacturing process to change

the inherent surface chemistry of the black. The amount of chemically – bonded oxygen on the surface area of the black is increased to enhance performance characteristics.

CHAPTER THREE

METHODOLOGY

3.1.0 Raw Material / Reagents Used

1. Paraffin Wax
2. Paraffin Oil
3. Distilled water
4. Carbon Black
5. Petroleum Jelly
6. Stearic Acid

3.2.0 Equipment / Apparatus Required

1. Heating Mantle
2. Weighing Balance
3. Thermometer
4. Glass Stirrer
5. Beaker
6. stainless Steal Can

3.3.0 Procedure

For the production of black shoe polish using carbon black from photocopier tonner, the following were used, paraffin wax, paraffin oil, petroleum jelly, carbon black, weighing balance, heating menthe, thermometer, distilled water, stearic acid was used in the color preparation.

3.3.1 Production of Black Shoe Polish From Paraffin Wax

100 g of the paraffin wax extracted was melted at 80 °C. The stearic acid was dissolved in 50 mls of distilled water.

3 g of the stearic acid were used in preparing the solution. The solution of stearic acid was added to the melted paraffin wax and heated on the heating mantle to 78 °C .

2 g of carbon black was added to a solution of stearic acid and then added to the mixture on the on the heating mantle and stirred to attain uniform mixture. Paraffin oil and petroleum jelly will finally be added to the resulting mixture and finally returned back to the heating mantle for relieving to about 48 °C.

After the mixture has been relieved to 48 °C, it was kept under an air conditioner to cool. It was finally poured into a shoe polish can and kept to cool further to attain ambient temperature.

CHAPTER FOUR

RESULTS

4.0 Result

The results obtained during the production of black shoe polish using carbon black from photocopier tonner are tabulated below:

Table 4.1: Physical test analysis

S/No	Characteristics	Black shoe polish from paraffin wax
1.	Water resistance	Fair
2.	Product texture	Hard with good binding
3.	Surface making appearance	Relatively black color
4.	Product odor	Naphtha odor
5.	Glass for finish leather	Fair enough

CHAPTER FIVE

DISCUSSION OF RESULTS

5.0 Discussion of Result

Based on the physical observation that was made out at the course of this research project on the production of black shoe polish using carbon black from photocopier tonner, comparison were made between it and the most popular known kiwi brand of shoe polishes manufactured by Nicholas laboratories (Nigeria) limited in Lagos.

From the comparison, a lot of short coming were observed as follows: it was observed that the shoe polish product was as soft and pasty as those manufactured from kiwi brand. The reason could be because of the type of wax used is not the best quality type carnauba wax is the best of wax used for production of black shoe polish as the literature habit but because carnauba wax is not available in our country (Nigeria) which could give an excellent shoe polish with no cracking surface and being rough.

Secondly, it does not posess good surf ace making and appearance when compared with kiwi polish. This was because it was suddenly cooled .

Therefore, it was expected that there is a need to be stabilized and stick to the operating temperature in the manufacturing process as well as ensuring that under cooling and over cooling of the products is guided against.

Thirdly, it was observed that the shoe polish which was produced does not exhibits a fine of glossy finish and better shine. This means that formation of crumbs may be due to lack thinning of which is of greet importance and we must be ensured that it is well done so that when adding solvent there will be no formation of crumbs to enable a thin film layer to be applied on a leather surface.

Fourthly, the color of this shoe polish is not as black as that of kiwi brand and naphtha color was strongly perceived from the shoe polish produced using carbon black while the kiwi brand makes use of the real black kiwi.

The stability on storage is fairly good enough for the shoe policy produced. Although established on storage for shoe polish depends on the weather of that particular environment.

CHAPTER SIX

CONCLUSION AND RECOMENDATION

6.0 Conclusion

After the physical observation gathered from the results during the production of black shoe polish, the following conclusions were drawn:

The shoe polish produced was not s soft and pasty as the kiwi brand. It did not posses good surface marking and appearance which compared with the kiwi brand. It did not produce a five glassy finish and better shine than the kiwi brand shoe polish produced.

These entire short comings in physical observation were primarily because of the source of raw material which is carnauba wax of a better quality than paraffin wax.

Carnauba wax cannot be obtained in Nigeria. Also the carbon black used s the colorant needs to be dissolved in the stearic acid for a longer acid of time which will affect the operating condition of the process.

Furthermore, it is also discovered that covering the product after sufficient cooling before storage is of greet advantage in order to prevent drying of cream and flaking off of the volatile solvent constituent of the cream. This observation was noticed and appreciated in the two portion of black shoe polish produced with one covered and the other one left uncovered on storage.

6.0 Recommendations

To be able produce a better quality shoe polish compared to kiwi band, the following points are recommendation are recommended.

Firstly, the use of carnauba wax as a major raw material in the production should be encourage for usage rather than the paraffin wax being used for the production in order to ensure better water resistance, nourishment and protection of smooth leathers/ shoes.

Finally, I recommended that production of black shoe polish should be given major attention by the federal government in this country, which could serve as means of income to the nation instead of importing the KIWI brand from other neighboring countries.

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