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COMPARATIVE STUDY OF PERFORMANCE OF SHOE POLISHES FORMULATED FROM POLYETHYLENE AND CARBON BLACK (C. I. BLACK PIGMENT 7)

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ABSTRACT
Polyethylene pigment was generated from "pure water sachets" (one of the major environmental nuisance today) and used in the formulation of shoe polish using paraffin wax, white spirit, turpentine oil, and nitrocellulose. The polish was found to exhibit similar wrinkle resistance, inferior gloss, rub resistance; resistance to fading and dust absorption resistance comparable to the one formulated from carbon black pigment. Polyethylene polish like the one formulated using carbon black pigment was found to be fairly well comparable with some commercial shoe polishes in most of the parameters evaluated.
***Keywords*:** Polish, Carbon, Resistance, Paraffin

INTRODUCTION
The primary function of shoe polish is to make the finished leather becomes smooth and glossy by gentle rubbing and also enhancing its performance and durability. (Turner, 1993). Shoe polish is a mixture of paraffin wax with pigment, solvent (white spirit), turpentine oil and nitrocellulose (Oslon, 1980 and (Rattee, 1978). Dyes and perfumes are sometimes added in the formulation (Morgans, 1990). Shoe polish is applied on leather products to repel other solvents or dust from the film surface and impart elasticity and gloss to the film with out destroying the hardness (Guthrie, 1994). This should make the polish remains as discrete solid particles held mechanically within the leather.

This work intends to explore the use of polyethylene pigment in the production of shoe polish. The shoe polish produced will be applied alongside shoe polish from carbon black (CI black Pigment 7) on finished black leather. Physical properties such as wrinkle resistance, gloss, rub resistance; resistance to fading and dust absorption were evaluated.

EXPERIMENTAL
Tanned and finished shoe leather (black) was obtained from International Tannery (Intertan) Limited, Sharada Industrial Area, Kano. The pure water sachet was obtained by hand picking within the premises of Bayero University Kano, (old campus).

Materials/Reagents
The Reagents used are paraffin wax, white spirit, turpentine oil, nitro cellulose and some commercial shoe polishes (labeled as X_1 and X_2).

Sample Preparation
Pure water sachets (polyethylene) was washed and dried, then burnt in an electric furnace in limited supply of oxygen at 250^0C. It was then grounded and sieved into fine black powder.

Purification of Wax
The paraffin wax was purified by melting over water three times. The wax was finally skimmed off and placed in a clean beaker.

Preparation of Shoe Polish
The shoe polish was formulated in accordance to the procedure earlier on, used in the production of shoe polish from carbon black (Gumel, 2006).

15g paraffin wax was melted at 97^0C to give a fine solution. The temperature was lowered to 60^0 C, 2g polyethylene pigment was added and stirred for 5 minutes. With further lowering of temperature to 30^0C, 12.5ml white spirit was also added and stirred for 15 minutes, then followed by 12.5ml turpentine oil and 25ml nitrocellulose respectively.

Application on Shoe Leather
The commercial shoe polishes ($X_1$and X_2), the laboratory prepared shoe polish, and shoe polish from carbon black was applied separately on finished black shoe leather samples. The application was done using a conventional method. Finally, visual assessment of the polishes themselves and polished leather samples was conducted.

Physical Testing of the Polished Leathers
The polished and shined leather samples were tested on some physical parameters as follows:

Luster/Gloss
The polished samples were examined for their gloss/luster by comparing them with one another.

Rub Resistance
The polished leather samples were rubbed with white and clean cotton material for about 40 times. The change in hue and level of staining were examined.

Fading Resistance
The polished leather samples were tested for fading resistance by exposing them to the sun for 74hrs. Finally, change in hue and gloss was used to assess the parameter.

Dust Absorption Resistance
The polished leather samples were exposed to an open environment where dust can get easy access to them for 24hrs. The level of dust adsorption was examined.

Wrinkle/Crease Resistance
The polished leather samples were each held at both end and creased as if washing garment to see if the polish will peel off the leather.

RESULTS AND DISCUSSION

Purification of Wax
The paraffin wax did not change color when heated over water. It melted very fast at 70^0C. It remains colorless and in liquid form after purification, before it cools to room temperature.

Hue and Texture
The hue and texture of the prepared shoe polish was evaluated in comparison with the carbon black shoe polish, and the commercial shoe polishes (Table 1).

From the table shoe polish prepared from polyethylene pigment was found to have shown the same hue and texture with the carbon black shoe polish. Both the two polishes showed inferior hue and texture compared to the commercial shoe polishes (i.e X_1 and X_2). This is due to the nature and tinting strength of carbon black and polyethylene pigment (Ababio, 1990 and Christie, 1993). Generally variations in hue and texture may be due to the nature of pigment and its interaction with the solvent and the nitrocellulose.

Table 1: Hue and Texture of the Shoe Polishes

Shoe Polishes	Hue	Texture
Polythene pigment	Dark and glossy	Soft
Carbon black	Dark and glossy	Soft
Shoe Polish X_1	Very Dark and glossy	Very soft
Shoe Polish X_2	Very Dark and glossy	Very soft

PHYSICAL PROPERTIES OF POLISHED LEATHER SAMPLES

Commercial shoe polishes, carbon black shoe polish and the polyethylene shoe polish are assessed for their physical properties (Table 2).

Table 2: Physical Properties of Polished Leather Samples.

Physical Property	Polythene Pigment	Carbon black	X_1	X_2
Luster/gloss	Good	V. Good	V. Good	V. Good
Rub resistance	Good	Excellent	V. Good	Good
Fading resistance	Good	V. Good	Excellent	Good
Dust absorption resistance	Good	V. Good	Excellent	Good
Crease/wrinkle resistance	V. Good	V. Good	V. Good	V. Good

From the result above it can be observed that, carbon black and commercial shoe polishes exhibited a very good gloss. Which comparably shown by the polish from polyethylene. This is due to the tinting strength of polythene pigment and its excellent interaction with solvent, oil and the nitrocellulose (Turner, 1993and Morgans, 1990).

Shoe polish from polythene showed good rubbing resistance, which is inferior to carbon black and commercial (X_1) shoe polishes, but the same with commercial (X_2) shoe polish. The fading resistance of the formulated shoe polish (Polyethylene pigment) showed almost the same with that commercial (X_2) shoe polish and also inferior to that of carbon black shoe polish. This is due to smooth texture and tinting strength of the polythene pigment. (Gumel, 2006)

Polyethylene pigment exhibited a good resistance to dust similar to that commercial shoe polish (X_2), but below that of carbon black and commercial (X_1) polishes. This was attributed to the small particle size and smooth texture of the pigment (Christie, 1993).

The shoe polish produced from polyethylene pigment showed a very good wrinkle resistance, which is the same in comparism with that of carbon black and the commercial (X_1 and X_2) shoe polishes. This is due in to the excellent interaction of the polyethylene pigment with the reagents used and adhesion of the polish to the finished leather (Guthrie and Lin, 1994).

CONCLUSION

Polyethylene pigment was found to form a good and compatible formula in the production of shoe polish. Its shoe polish exhibited soft texture, dark hue, and very good wrinkle resistance comparable to carbon black and commercial shoe polishes (X1 and X_2).

The use of polythene pigment in shoe polish production is hereby recommended as it will reduce extensively, the level of pollution, which arises as a result of indiscriminate disposal of “pure water sachet” in our environment.

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