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METHOD OF DYEING ANIMAL FIBERS

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8 Claims. (Cl. 195—51)

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This invention relates to improvements in methods of dyeing hair, fur and the like, and it relates particularly to methods of applying to hair, fur or the like materials capable of conversion into colored pigments and converting them into suitable colored pigments.

The dyes used heretofore for dyeing hair or fur, for example, human hair, animal pelts, and the like, may be classified generally as metallic salt dyes and organic dyes.

Most, if not all, of these dyes have, in common, the characteristic of being toxic to many individuals. Paraphenylenediamine, a dye commonly used in the fur dyeing business is highly toxic and many cases of poisoning occur yearly from the use of this compound. Also, many of these dyes produce allergic reactions even though the dyes in themselves may not be regarded generally as toxic when used in reasonable concentrations.

For the above reasons, the hair and fur dyes now commonly available are not all that might be desired for universal usage.

It has been recognized in the past that naturally or physiologically occurring compositions are capable of forming dark-colored pigments.

It is known, for example, that pigment formation in warm blooded animals is brought about by the action of an enzyme on a colorless propigment known as dioxyphenylalanine. Also, it is known that the vegetable kingdom has an analogous system for producing dark-colored pigments. For example, the discoloration of freshly cut potatoes is brought about by the action of an enzyme or oxidase, tyrosinase, on the colorless propigment tyrosine resulting in the formation of melanine, a dark-colored pigment.

In 1932, I published a paper entitled "Optical specificity of dioxyphenylalanine oxidase, the melanogenic enzyme of the skin" (Archives of Dermatology and Syphilology, Sept. 1932, vol. 26, pp. 499 to 503), in which I showed that it was levorotatory dioxyphenylalanine ("dopa") which was the real propigment to the dark colored skin, hair or eye pigments.

I have now discovered that by using the propigments referred to above, and others, either alone or with suitable oxidases and within a controlled range of pH values that I can produce natural dark-colored pigments on hair, fur or other keratinaceous substances.

An object of the invention, therefore, is to provide a method of dyeing keratinaceous substances with physiologically occurring substances that will be free from toxic or allergic reactions.

A further object of the invention is to provide

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a method of dyeing hair or fur by applying physiologically occurring propigments and converting such propigments into dark-colored pigments in situ.

The method embodying the invention comprises applying to the hair or the fur a slightly acid, neutral or alkaline solution of the propigment and allowing it to oxidize or causing it to be oxidized by a suitable oxidase which is applied to the hair simultaneously with, or subsequently to, the application of the propigment.

The color to be developed on the hair or fur determines to a large extent upon the concentration of the propigment deposited on the hair and the extent of oxidation of the propigment. This latter factor is determined largely by time. Thus, to produce a light brown color, a solution of the propigment or the propigment and an oxidase is applied to the hair and caused to oxidize by blowing warm air over it, for example, by means of a hair drier. The oxidizing action is carried on until the proper color is attained, after which, the hair is rinsed or washed to remove the remaining unoxidized propigment. The concentration of the propigment may be varied considerably.

A typical method embodying the invention comprises applying to fur or hair an aqueous solution of tyrosine containing tyrosinase and having a pH value between 6 and 8. The solution is permitted to dry slowly on the fur or hair until a light brown pigment is formed.

Similar results can be obtained by applying a neutral or slightly alkaline aqueous solution of dioxyphenylalanine to hair and drying it slowly until the desired color is obtained. The formation of the brown pigment is somewhat slower in this case.

Tyrosine, alone, may be used, at a pH value of 7 or above, for dyeing hair or fur although the formation of the pigment, melanin, requires considerably longer time.

The conversion of dioxyphenylalanine ("dopa") to a brown pigment may be accelerated by the addition of tyrosinase or a polyphenolase to the solution. The polyphenolases are present in the leucocytes and, therefore, are physiologically occurring substances.

Other physiological compositions, such as adrenalin, will also form colored pigments when oxidized at a pH value of 7 or above, and the oxidation of such propigments can be accelerated by the addition of an oxidase such as tyrosinase or polyphenolase.

The great advantage of dyes of the type de-

scribed above is that they are not harmful to individuals being treated with or handling them. Moreover, natural shades or colors are developed when such propigments as tyrosine and dioxyphenylalanine are used inasmuch as they normally are the source of the coloring pigments present in the skin, hair and eyes or vegetable matter.

From the preceding description of typical methods embodying the present invention, it will be understood that I have developed methods of dyeing hair, fur or other keratinaceous substances that are free from the harmful effects associated with the non-physiological dyes heretofore used.

It will be understood that the proportions of the components may be varied considerably and their manner of application to the hair or fur is susceptible to considerable variation. Therefore, the above described methods of dyeing keratinaceous substances are illustrative and should not be considered as limiting the scope of the following claims.

I claim:

1. A method of dyeing keratinaceous substances which comprises applying to the surface of the substance a physiologically occurring propigment of the class consisting of dioxyphenylalanine and tyrosine, and oxidizing the propigment in said substance.

2. A method of dyeing keratinaceous substances which comprises applying to the surface of the substance a physiologically occurring propigment of the class consisting of dioxyphenylalanine and tyrosine, and oxidizing the propigment in said substance with an oxidase.

3. A method of dyeing keratinaceous substances which comprises applying to the surface of the substance a physiologically occuring propigment of the class consisting of dioxyphenylalanine and tyrosine, and oxidizing the propigment on said substance with an oxidase of the class consisting of tyrosinase and polyphenolases.

4. A method of dyeing animal fibers which comprises applying to the surfaces of said fibers a solution containing dioxyphenylalanine having a pH value of about 7 to 8, and drying and oxidizing said solution on said fibers.

5. A method of dyeing animal fibers which comprises applying to the surfaces of said fibers a solution containing dioxyphenylalanine and an oxidase and having a pH value of about 7 to 8, and drying and oxidizing said solution on said fibers.

6. A method of dyeing animal fibers which comprises applying to the surfaces of said fibers a solution containing dioxyphenylalanine and tyrosinase and having a pH value of about 7 to 8, and drying and oxidizing said solution on said fibers.

7. A method of dyeing animal fibers which comprises applying to the surfaces of said fibers a solution containing tyrosine having a pH value between about 6 and 8, and drying and oxidizing said solution on said fibers.

8. A method of dyeing animal fibers which comprises applying to the surfaces of said fibers a solution containing tyrosine and tyrosinase having a pH value between about 6 and 8, and drying and oxidizing said solution on said fibers.

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