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PROCESS OF PRODUCING NATURAL OR
ARTIFICIAL FIBERS HAVING DYEING
PROPERTIES RESEMBLING THOSE OF
WOOL AND PRODUCTS OBTAINED THERE-
BY

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Our present invention relates to the produc-
tion of fibers, foils, threads, ribbons and the like
materials which are capable of being dyed with
acid wool dyestuffs.

5 We have previously disclosed in our application
Ser. No. 223,012, filed August 4, 1938, that it is
possible to produce artificial textile materials
capable of being dyed with acid wool dyestuffs
in the same manner as wool by incorporating
10 and finely dispersing in the solutions from which
the textile materials are to be formed a syn-
thetic resinous composition stable against dilute
acids and alkalis which resinous composition is
the product of the joint polymerization of an
15 alkylene imine and a protein and an arylisocyanate or an arylisothiocyanate.

By the present application which is a con-
tinuation in part of the aforesaid application
Ser. No. 223,012 we extend the application of
20 the said resinous compositions also to natural
cellulosic fibers and to artificial fibers in such
cases where it is not desirable or possible to in-
troduce or finely disperse the resinous compo-
sitions in the spinning solutions.

25 The present invention therefore has for an
object to provide textile materials such as
threads, fibers, foils, ribbons and the like which
may be easily dyed with acid wool dyestuffs.

A still further object resides in the provision
30 of fibers which are impregnated with basic re-
acting resins and which are capable of being
dyed directly with acid wool dyestuffs.

Additional objects will appear from the fol-
lowing detailed specification.

35 We have found that by impregnating artificial
fibers or natural fibers such as for instance cot-
ton with an alkylene imine or a similar organic
base, a solution of an albuminous substance, a
solution of an arylisocyanate or an arylisothio-
40 cyanate and heating the impregnated fibers to
a temperature sufficiently elevated to cause poly-
merization of the alkylene imine with the isocyanate, fibers are obtained which have exactly the
character of wool as regards the capacity of be-
45 ing dyed with acid dyes and the fastness of the
dyeings to washing and to light. We are aware
that processes of impregnating fibers with var-
ious substances including resins have been pro-
posed. The dyeings on the fibers hitherto pro-
50 duced according to these processes have been
unable to satisfy practical requirements as re-
gards properties of fastness in all respects. Con-
trary to these prior art proposals the present
invention provides fibers which are characterized
55 by sufficient fastness to washing, perspiration,

rubbing and other friction, and satisfactory fast-
ness to light.

Fibers which have been made from casein so-
lutions of course do not need an additional im-
pregnation with an albuminous substance. In
these cases it is sufficient to impregnate the ar-
tificial fibers with alkylene imines and the aromatic isocyanate. After the impregnation the
resin may be produced on the fibers by polymer-
ization which can be effected by heating. The
10 dyeings with wool dyestuffs on casein fibers in
this manner are essentially faster than dyeings
on ordinary casein fibers which have not been
impregnated with the resins.

The fibers may be impregnated with the fin-
ished resinous compositions in solution where-
after further condensation on the fibers is ef-
fected by a short additional heating. On the
other hand they may be impregnated with the
constituents of the resin and condensation may
20 be effected on the fibers by heating and drying.

Suitable starting materials for the polymeri-
zation have been described in our copending
U. S. patent application Ser. No. 223,013 filed
August 4, 1938.

The following may be mentioned as examples.

Suitable organic bases are, for instance, the
alkyleneimines, such as ethylene-, propylene-
and butylene-imines, N-propyl-ethyleneimine and
N-benzylethyleneimine.

Furthermore aliphatic and aromatic amines,
such as methylamine, stearylamine and aniline
may be employed.

Suitable protein substances are casein, albu-
men, gelatin, and the like materials.

As aryliso- and arylisothiocyanates there may
be employed mainly the phenyl- and naphthyl-
isocyanates as well as the phenyl- and naphthyl-
isothiocyanates, benzylisocyanate, and related
40 compounds.

The following examples serve to illustrate the
invention.

Example 1

Fibers made from casein or fibers containing
45 casein are immersed in a benzene solution of
30 per cent strength of ethyleneimine and led
through the solution several times by means of
creasing rollers. After the ethyleneimine solu-
tion has acted upon the fibers for about 30 min-
50 utes the adhering liquid is removed from the
fibers, if necessary by centrifuging, and they are
immersed in a solution of phenylisocyanate for a
few minutes. The fibers are then removed from
the phenylisocyanate solution. Thereupon they 55

are thoroughly centrifuged, steamed for some time and then dried. After drying the fibers are advantageously washed once more in soap water.

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Example 2

A strand of cotton is immersed in a solution of 1 part of casein, 5 parts of an aqueous ethyleneimine solution of 30 per cent strength and 5 parts of phenylisocyanate. The impregnated cotton threads are centrifuged and heated for an hour at a temperature of 7° C. A polymerization product is formed on and in the cotton fibers which adheres strongly thereto and cannot be removed by scouring and washing. The cotton fibers acquire a distinct affinity for acid dyestuffs such as for instance Palatine Fast Blue BR (Schultz Farbstofftabellen, vol II, 7th edition, page 168), Supramine Red B (Schultz Farbstofftabellen, vol. II, 7th edition, page 203), Acid Anthracene Red 3 BL (Schultz Farbstofftabellen, Suppl. vol. I, 7th edition, page 125) and meta-chrome dyestuffs. The dyeings on these fibers are absolutely fast to light.

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Example 3

Rayon staple fibers in the form of yarns or threads are immersed into a solution of ethyleneimine and casein in a proportion of casein to ethyleneimine of 1 in 3. The threads are centrifuged to remove excess liquid and immersed into a solution of phenylisocyanate in cyclohexanol. The threads are again centrifuged and inserted into a drying apparatus at a temperature of 80° C. for an hour. The fibers thus obtained may be dyed in one bath together with wool fibers without any difference in the absorption of dyestuff from the bath being noticeable between the two kinds of fibers.

We claim:

1. A process of producing films, fibers, foils, ribbons and the like materials capable of being dyed by acid wool dyestuffs, which process comprises impregnating a textile material having per se insufficient affinity for acid dyes with a solution of a resinous composition comprising an alkylene imine, a protein and a member selected

from the class consisting of arylisocyanates and arylisothiocyanates and heating the impregnated fibers until they are completely dry, whereby joint polymerization of the constituents with formation of a resin occurs.

2. A process of producing fibers, films, foils, ribbons and the like materials capable of being dyed by acid wool dyestuffs which process comprises impregnating a textile material having per se insufficient affinity for acid dyes with a solution of a mixture of a protein and an alkylene imine, immersing the impregnated textile materials into the solution of a member selected from the class consisting of arylisocyanate and arylisothiocyanates and heating said textile materials to a temperature sufficiently elevated to cause joint polymerization of the constituents with formation of a resin.

3. A process of producing fibers, films, foils, ribbons and the like materials capable of being dyed by acid wool dyestuffs which process comprises impregnating a textile material having per se insufficient affinity for acid dyes with a solution of ethyleneimine and casein, immersing the impregnated textile materials into a solution of phenylisocyanate and heating the textile materials to a temperature of from 60 to 100° C. until said textile materials are completely dried, whereby joint polymerization of the constituents with formation of a resin occurs.

4. Textile materials impregnated with a resin being the product of a joint polymerization of one alkylene imine, a protein and a compound selected from the class consisting of arylisocyanates and arylisothiocyanates, which resin is substantially insoluble in acids and alkalis and imparts to said textile materials affinity for acid dyes.

5. Textile materials impregnated with the resin produced by jointly polymerizing ethylene imine, casein, and phenylisocyanate, which resin is substantially insoluble in acids and alkalis and imparts to said textile materials affinity for acid dyes.

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