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IMPROVED REFINED WOOD PULP AND A METHOD OF IMPROVING IT

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This invention relates to chemically prepared wood pulp such as the so-called "dissolving pulp," hereinafter, for convenience, called "refined wood pulp." The invention has for an object the provision of an improved refined wood pulp and a method of producing the same. The improved wood pulp of the invention is especially suitable for the manufacture of regenerated cellulose products by the viscose process and for the production of cellulose derivatives such as cellulose acetate, etc.

The invention further relates to the production of cellulosic products from refined wood pulp and aims to provide certain improvements in carrying out one or more of the processing steps used in the production of such products.

In one of its important aspects the invention relates to producing a pulp of uniform characteristics from different pulps having different percentages of unsaponifiable and saponifiable ether extractable matter.

In another of its important aspects, the invention involves the use of refined wood pulp as a source of cellulose in the preparation of cellulosic solutions for the viscose process and has for a particular object the use of an unsaponifiable, oil soluble, interfacially active material of synthetic origin to improve the emulsification or dispersion of non-miscible opacifying agents in viscose solutions used in spinning filaments, particularly as regards stabilizing emulsions produced in the presence of anion-active emulsifying materials. The invention also generally brings about improvements in other processing steps and may be used with bright as well as opacified viscose.

Refined wood pulp consists mainly of cellulose with relatively small amounts of non-cellulosic impurities, such as hemi-celluloses, fats, resins, waxes, high molecular weight alcohols, etc. A substantial portion of the non-cellulosic impurities is extractable with ether, and is hereinafter called the "ether extract" or the "ether extractable matter."

I have found that the ether extract contains two distinctly different types of materials which possess or can exert under appropriate conditions interfacially active properties and which have important effects on the processing qualities of the pulp in the production of cellulosic products. These two classes are:

1. The saponifiable portion of the ether extract (otherwise termed ether extractable saponifiable matter) which is of the nature of fatty and resin acids either in the free state or combined in such

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forms as glycerides or esters of higher alcohols. These materials in their saponified state are water soluble soaps, i. e., are anion active agents. (Where numerical values for saponifiable matter are herein given, such values refer to the total amount of fatty and resin acids, both in free and combined form.)

2. Another portion consisting of unsaponifiable materials which are substantially non-volatile, insoluble in water and dilute caustic soda, soluble in oil, and interfacially active at an oil-water interface. These unsaponifiable, oil soluble, interfacially active materials are in general high molecular weight alcohols such as phytosterol. (Phytosterol is the generic name for sterols derived from vegetable sources.)

Part of the phytosterol is in the form of saponifiable esters with higher fatty acids. On saponification these esters form soaps and liberate free phytosterol. The phytosterol itself is, however, unsaponifiable whether in free or combined form. Furthermore, in this connection in referring to the unsaponifiable portion of the ether extract (otherwise termed "ether extractable unsaponifiable matter") there is meant all the water insoluble residue which in a saponification treatment does not combine with caustic alkalies to form water soluble soaps, irrespective as to whether such material is in free or combined form in the ether extract.

As commonly used and as referred to specifically herein, the term "interfacially active" applied to a material refers to the material being capable of lowering the interfacial tension at an interface by virtue of a positive adsorption therein. The term "surface active" material refers to a water soluble material which will specifically reduce the interfacial tension at an air-water interface, such a liquid-air interfacial tension being commonly termed the "surface tension." By the term "anion active material" is meant a water soluble, ionizable surface active material, the surface activity of which is due to the anion. Such materials may be present in the pulp in an actually anion active form, or in a form which is converted to a soap by the action of alkali.

Naturally occurring unsaponifiable, oil soluble, interfacially active agents constitute a large fraction of the unsaponifiable portion or residue of the ether extract. The unsaponifiable ether extractable matter also contains other fractions such as hydrocarbons and chlorinated hydrocarbons which are not interfacially active. Nevertheless, the amount of total unsaponifiable ether extractable matter serves generally as a

relative indication of the amount of unsaponifiable, oil soluble, interfacially active material and is a more easily determined value.

I have found that as regards different woods commonly used for producing pulp, such as pine, spruce, and hemlock, the ether extract left in the refined pulp varies appreciably in the content of unsaponifiable matter, and thus also as regards the proportions of oil soluble, unsaponifiable, interfacially active material and of saponifiable matter which will be interfacially active in the water soluble, saponified state. A comparison of the compositions of ether extracts from refined pulps prepared from different woods and having the same total amounts of ether extract follows:

TABLE I

Comparison of composition of ether extracts of refined chemical pulp prepared from different woods

Wood Used in Preparing Pulp	Percent of Material Present Based on Bone Dry Pulp		
	Total Ether Extract	Saponifiable Matter	Unsaponifiable Matter
Hemlock	.10	.0566	.0345
Spruce	.10	.0484	.04
Southern Pine	.10	.072	.01044

Such figures as given above are also somewhat dependent on the process by which the pulp is made.

The two classes of extractable materials which are interfacially active or which can become interfacially active have different physical and chemical properties and exercise different effects in the subsequent utilization of the pulp, as in its conversion into various cellulosic products in the chemical and rayon industries. Some of these effects are desirable while others are not, but uniformity of effect is very desirable.

I have discovered that the behavior of the refined wood pulp in its conversion into various cellulosic products cannot be predicted on a basis of the amount of residual ether extract considered as a whole. I have found, for example, that hemlock and southern pine pulps each having the same quantity of ether extract, say 0.15%, do not have the same properties because the hemlock pulp will contain a higher proportion of ether extractable, unsaponifiable matter. The hemlock pulp thus contains a higher proportion of oil soluble, unsaponifiable, interfacially active materials and a lower proportion of saponifiable matter, interfacially active in the water soluble, saponified state.

It is accordingly one of the objects of my invention to provide a refined wood pulp containing uniform quantities of either saponifiable matter, interfacially active when saponified, or unsaponifiable interfacially active ether extractable matter, or both, regardless of the kind of wood from which the pulp was produced.

In accordance with the method of my invention, I attain uniformity of pulp composition with respect to ether extract by ascertaining the kinds and proportions thereof in the pulp and then adding the required amount of synthetic, oil soluble, unsaponifiable, interfacially active materials of a type not found in nature or saponifiable fatty or resin acid soap-forming materials (either as such or as their effective equivalents in the form of saponified soaps), to

produce a pulp with a uniform amount of either one or both together as required.

In practice the invention is applied to wood pulp containing not over 0.15% of natural ether extractable matter consisting of saponifiable and not over 0.07% of oil soluble, unsaponifiable matter. The adjustment of saponifiable and unsaponifiable matter to predetermined value is carried out such that the total amount of unsaponifiable matter, both natural and synthetic does not exceed 0.07%.

The unsaponifiable, oil soluble compounds used as additives in my invention are in general ethylene glycol monoethers of high molecular weight alcohols. These agents, described later in detail, are purely synthetic and do not occur at all as natural constituents of pulp ether extracts.

The synthetic, unsaponifiable compounds are extremely effective in regard to their interfacially active properties. The compounds are in general relatively inexpensive as compared with natural, unsaponifiable, oil soluble, interfacially active materials. Furthermore, as synthetic compounds, the compounds of the invention have the advantage of being readily producible in a pure and uniform state.

The refined wood pulps applicable to use in the invention, such as the so-called "dissolving pulps," usually contain less than 0.07% of unsaponifiable ether extractable matter. The invention, however, is especially and advantageously applicable to those pulps containing a relatively low percentage of unsaponifiable ether extractable matter, say less than 0.02%, wherein substantial additions of the synthetic oil soluble, unsaponifiable compounds are necessary to attain a uniform content of said matter, not greater than 0.07%, in all species of refined wood pulp.

As heretofore pointed out, the amount of unsaponifiable ether extractable matter has been chosen as a standard rather than the exact amount of unsaponifiable, ether extractable, interfacially active matter in that the former serves as a relative indication of the amount of the latter and may be much more readily determined.

While it will be readily obvious to anyone skilled in the art how to determine ether extractable unsaponifiable matter, nevertheless for clarity, I give the standard procedure which follows: 350 gm. of pulp of known moisture content, usually about 4–8% moisture, is extracted 8 hours with ether in a Soxhlet extractor. The ether is evaporated off the extract solution and the residue may be weighed if desired to determine the total amount of ether extractable matter. The residue from the ether evaporation is then refluxed with 100 cc. normal alcoholic KOH for 1 hour. The solution is then transferred to a separatory funnel, an equal quantity of water added and the unsaponifiable matter extracted with ether. The ether solution is washed with water, dried by addition of anhydrous Na_2SO_4, after which the solution is filtered, the sodium sulfate being discarded after being washed with ether. The ether is evaporated off and the residue heated 1 hour at 105° C., then cooled and weighed. The value for ether extractable unsaponifiable matter so obtained is then calculated as the per cent on bone dry pulp.

Wood pulp as usually prepared as a source of cellulose for the viscose industry is of various degrees of purity, and is generally supplied for use in the form of sheets. Normal dissolving wood pulp in present use consists mainly of cel-

lulose and contains an appreciable amount of non-cellulosic impurities, such as hemi-celluloses, fats, resins, waxes, etc. One of the main objects in the manufacture of highly refined dissolving pulp is to remove as much as possible of the non-cellulosic impurities so that a whiter, purer pulp results which is capable in the manufacturing of rayon of producing a higher grade yarn.

As described in U. S. Patent Re. 22,489, not all of the non-cellulosic impurities which can be removed are undesirable from the standpoint of viscose processing, and in fact certain of such impurities, normally present in small amounts, act beneficially as emulsifying agents in the step of emulsifying or dispersing oils or pigments in the viscose. These beneficial impurities which have been known to act as emulsifying agents are surface active materials of the anion active class or materials which can give rise to the production of such surface active materials during the processing of pulp into viscose. In a pulp which has not been highly refined most of these beneficial impurities constitute a portion of the materials removed by organic solvents, as for example, ether, benzene, alcohol, etc. These impurities which act as anion active emulsifying agents are of the nature of fats, oils, fatty acids, rosin and resin acids, all of which become incorporated in the viscose as sodium soaps.

In theory, the problem of making a good pulp for viscose processing could be solved by removing all the undesirable impurities while retaining in suitable amounts those impurities which facilitate the steps of emulsification and other processing steps. Under such theoretical conditions, the impurities which it would be desired to retain in suitable amounts from the standpoint of emulsification would be of two quite different types:

1. The natural oils, fats and fatty acids, rosin and resin acids, which in the viscose process form soaps. Such soaps in addition to improving the processing of the pulp into viscose, also due to their presence in the viscose, act as emulsifying agents.

2. The natural interfacially active materials soluble in oil and insoluble in water heretofore described in detail. These materials function as stabilizers of emulsions produced by the acid of anion active agents.

In practice such a clean-cut separation is difficult to accomplish directly. Better results are obtainable by removing most or all of the impurities, including the unsaponifiable ether extractable matter, and then incorporating in the viscose small amounts of the synthetic unsaponifiable compounds of the invention. Where the content of natural soap-forming, emulsifying materials is low, anion active materials may also be added in accordance with Patent Re. 22,489.

In refined wood pulps, the unsaponifiable portion of the ether extractable matter will generally fall below 0.07%. While my invention is applicable to use in cellulosic solutions prepared from refined wood pulp containing not more than 0.07% ether extractable unsaponifiable material, the advantages of adding the unsaponifiable, oil soluble, interfacially active material according to the invention are especially great when the pulp contains less than 0.02% unsaponifiable material.

In accordance with this phase of the invention, a small quantity of the synthetic unsaponifiable compound of the invention is incorporated in the cellulosic material used in producing a viscose solution, at least prior to completion of shredding

the alkali cellulose, and preferably to the pulp prior to use, to improve the characteristics of the spinning solution, particularly with regard to emulsification with opacifying agents.

Since the synthetic unsaponifiable, oil soluble, interfacially active materials are insoluble in water or dilute caustic soda they become dispersed in a finely divided condition in the viscose. Since the materials are oil soluble, they are thus in part extracted from suspension in the aqueous viscose phase by means of the oil droplets during the emulsification process. In order for this extraction process to take place an efficient degree, it is not only necessary for the materials to be oil soluble but also that they be substantially water insoluble.

The synthetic unsaponifiable compounds which I add in practicing my invention, like conventional surface active materials, are hydrophilic-lipophilic combinations. These compounds have a strong lipophilic group of a hydrocarbon character, together with a group having a relatively weak hydrophilic effect. Thus, the interfacially active unsaponifiable compounds used in my invention are at least slightly oil soluble but substantially water insoluble. While the hydrophilic effect is not enough for the compounds to be appreciably soluble in water, there is nevertheless a substantial attraction for water. Hence the compounds will tend to concentrate wherever there is an oil-water interface with the lipophilic portion dissolved in the water.

The compounds used in my invention do not greatly lower the surface tensions of any oils they dissolve in. Being substantially insoluble in water or aqueous solutions, they do not appreciably lower the surface tension of aqueous phases. Nevertheless, when present at an oil-water interface they produce very low interfacial tensions.

In general, the unsaponifiable materials or compounds are ethylene glycol monoethers of high molecular weight alcohols, i. e., of alcohols containing at least 8 carbon atoms. The alcohols are hydroxyl substituted hydrocarbons and may be aliphatic (straight or branched chain, saturated or unsaturated) or cyclic. They may be primary, secondary, or tertiary. I prefer to use high molecular weight aliphatic alcohols (branched chain or straight) containing 8–18 carbon atoms. The ethylene glycol monoethers may be prepared in a manner similar to that generally employed in manufacturing lower molecular weight glycol monoethers such as are used in solvents (e. g., the methyl, ethyl or butyl monoether of ethylene glycol). Thus, for example, an alcohol containing at least eight carbon atoms may be reacted with an equivalent amount of ethylene oxide to give a product predominating in the monoalkyl ether of ethylene glycol.

The following unsaponifiable, oil soluble, interfacially active compounds are examples of compounds which may be used in the practice of my invention:

Ethylene glycol monoether of octyl alcohol (2-ethylhexanol).

Ethylene glycol monoether of tetradecyl alcohol (7-ethyl-2-methylundecanol-4).

Ethylene glycol monoether of oleyl alcohol.

When viscose is emulsified with mineral oil, even if the oil particles are relatively fine, if the emulsions are not completely stable, there will be a tendency for the emulsions to cream or for a scum to separate. In the viscose industry such scums are extremely troublesome in that they

tend to collect in various lines and tanks and may work into the spinnerets where they will cause inferior or spoiled yarn. I have found that such scums tend to occur when the amount of ether extractable unsaponifiable material in the pulp is low, i. e., when such material is below 0.07% and especially when in the range of 0 to 0.02%. In such cases the scum will still be obtained even when anion active emulsifying agents are added to aid the emulsifying step.

A convenient laboratory test indicative of the relative amounts of scum obtainable in commercial operations with oil-opacified viscose from different pulp samples follows: 800 gm. of viscose is emulsified for 5 minutes with 0.4% mineral oil based on viscose using a small bladed paddle revolving at 4000 R. P. M. Portions of the freshly emulsified viscose samples are then centrifuged for 1 hour at a force of 1500 x gravity. The amounts of scum which may separate out as layers on the tops of tubes from various viscose samples are compared.

When the unsaponifiable material is added according to the invention to pulps that would normally give scum in the above test, scum is either completely eliminated or greatly reduced. In addition microscopic examinations show that the addition of the unsaponifiable material greatly improves the emulsion characteristics, imparting greater stability of particle size, greater uniformity and smaller average particle size.

That scum formation is due to a lack of natural unsaponifiable ether extractable material may be seen from the following table. The table also shows the remarkable effect on reduction of scum by addition of a small amount of the ethylene glycol monoether of 7-ethyl-2-methylundecanol-4.

or by means of a rotating roll partly immersed in such an emulsion or dispersion. If desired, the unsaponifiable, oil soluble, interfacially active compounds may be incorporated in the pulp prior to sheet formation as, for example, by making additions to a suspension of pulp in water in a stock chest.

The application of the unsaponifiable materials or compounds to the pulp may be accomplished by use of a solution of the compound in a satisfactory organic solvent but more practically, from an economical standpoint, by use of an aqueous emulsion as described above. The preparation of such an aqueous emulsion may be effected by any appropriate procedure common to the art, generally in the presence of a small amount of a water soluble emulsifying agent.

For application during the shredding operation, the compounds may be sprayed directly onto the alkali cellulose as a concentrated solution in a suitable organic solvent, preferably a water miscible, volatile solvent such as ethyl alcohol or isopropanol. They may also be sprayed into the shredder as a concentrated emulsion or liquid compounds may be employed in undiluted form.

Where the total ether extractable content of the pulp is very low, in addition to adding the unsaponifiable compounds of the invention, there may also be added according to Patent Re. 22,489 fatty or resin acid soap-forming materials or their effective equivalents in the form of the anion active, water soluble saponified soaps. Also other anion active agents may be added according to Patent Re. 22,489. When such materials are added in a water soluble,

TABLE II

Effect on scum in viscose emulsions of unsaponifiable portions of pulp ether extractable matter and of an oil soluble, ethylene glycol monoether of an aliphatic alcohol (ethylene glycol monoether of 7-ethyl-2-methylundecanol-4)

Pulp Used	Amount and Source of Unsaponifiable Ether-Extractable Material	Amount and Source of Saponifiable Ether Extractable Material	Amount of Scum Obtained in Scum Centrifuge Test
#1 Pulp	0.034% Natural	0.057% Natural	Trace of Scum.
#2 Pulp	0.013% Natural	0.065% Natural	Heavy Scum.
#2 Pulp Impreg. with 0.05% of Unsaponifiable Ether Extractable Material from #1 Pulp.	0.034% Natural +0.05% from #1 Pulp	0.065% Natural	Very Small Trace of Scum.
#2 Pulp Impreg. with 0.05% of Saponifiable Ether Extractable Material from #1 Pulp.	0.013% Natural	0.065% Natural 0.05% from #1 Pulp	Heavy Scum, addition having no effect.
#3 Pulp, being of the same manufactured type as #2 Pulp	0.005% Natural	0.025% Natural	Heavy Scum.
#3 Pulp Impreg. with 0.02% ethylene glycol monether of 7-ethyl-2-methylundecanol-4.	0.005% Natural 0.02% added	0.025% Natural	No Scum.

The oil soluble ethylene glycol monoethers of aliphatic alcohols may be incorporated in the finished wood pulp, or during the formation of the pulp sheet or during the viscose processing, prior to the completion of shredding. Since the materials are not soluble in water, it is not practical to add them directly to the viscose. Such direct addition gives an unsatisfactory distribution of the material in the viscose so that if the viscose is subsequently emulsified, the emulsion will not be satisfactorily stabilized. A most practical and convenient method of securing the presence of the desired amount of unsaponifiable material in the viscose in a satisfactorily fine state of subdivision is to incorporate the compound in the wood pulp. Such an addition may be advantageously effected to the pulp on the sheet forming machine subsequent to sheet formation but prior to complete drying by spraying the pulp sheet with an aqueous emulsion or dispersion of the compound

anion active condition, it will frequently be convenient to emulsify the unsaponifiable, oil soluble, interfacially active materials in a solution of the anion active compound. Of the anion active or potentially anion active compounds, the most suitable are the saponifiable soap-forming materials (fatty or resin acid materials) or their effective equivalents in the form of the saponified soaps.

With highly refined pulp, as the ether extractable material approaches zero, if only the unsaponifiable, oil soluble, interfacially active compounds are added without anion active compounds, some improvements are obtained but the advantages of the invention are obtained only in part.

In the preferred form of the invention, in addition to the glycol ethers of aliphatic alcohols, anion active compounds will be present, either through their presence in natural form in the ether extractable material or by addition.

While the synthetic unsaponifiable, oil soluble, glycol monoethers used in this invention are especially suitable for use in combination with anion active or potentially anion active compounds, they are also suitable for use in combination with cation active compounds, nonionic surface active compounds and mixtures of these.

Since the amount of unsaponifiable ether extractable matter varies widely in pulps from different woods, the invention makes it possible to impart to pulp from one wood many of the processing characteristics of pulp from a different wood. In this way, I can produce a uniform refined wood pulp; in other words, an industrially uniform composite irrespective of the many different kinds of woods from which it originates.

While scum formation is not normally encountered in bright (non-delustered) viscose, use of pulp treated with an unsaponifiable compound in the manner of the invention is, however, also advantageous in the preparation of bright viscose. Such treatment minimizes foaming and occlusion of air in the viscose during the various mixing operations. Treatment of the pulp with the glycol ethers of aliphatic alcohols of the invention is especially desirable when treating the pulp according to Patent Re. 22,489 with soaps which tend to promote foaming of the viscose. Thus, for example, the unsaponifiable compound can be emulsified in sodium oleate solution and the emulsion used to treat the pulp sheet either on the dryer of the pulp machine or in a subsequent operation.

When viscose is emulsified with oil for the preparation of delustered rayon, the oil constitutes only a very small portion of the delustered material. Accordingly, since the unsaponifiable compounds dissolve in the oil rather than in the aqueous phase only extremely small quantities of them are required, the effective range of the unsaponifiable compounds being such as to give a total content of unsaponifiable matter, including both natural ether soluble and the synthetic glycol ethers of from 0.01 to 0.07% and preferably from 0.02 to 0.05%. Since the unsaponifiable materials or compounds are not truly soluble in the viscose but rather disperse, with more than 0.07% of such materials, some material may tend to separate out in the viscose, particularly with bright viscose. Accordingly, it is important that the compounds be added only in extremely small amounts as specified. The percentages used herein are based on the bone dry weight of the pulp.

This application is a continuation-in-part of my application Serial Number 601,063, filed June 22, 1945, U. S. Patent 2,518,680 and my application Serial Number 631,223 filed November 27, 1945, U. S. Patent 2,516,113.

I claim:

1. The method of improving refined wood pulp containing not over 0.15% of natural ether-extractable matter, of which less than 0.07% is oil-soluble unsaponifiable matter, which comprises adding to such refined wood pulp an ethylene glycol monoether of an aliphatic hydroxyl-substituted hydrocarbon having from 8 to 18 carbons atoms, the amount of the added monoether of the substituted hydrocarbon being such as not to cause said oil-soluble, unsaponifiable matter to exceed about 0.07%, based on the bone dry weight of the pulp.

2. The method of claim 1 in which the amount of the added monoether of the substituted hydrocarbon is such as not to cause the ether-extractable matter in the pulp to substantially exceed 0.15%, based on the bone dry weight of the pulp.

3. The method of claim 1 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of 7 - ethyl - 2 - methyl - undecanol-4.

4. The method of claim 1 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of oleyl alcohol.

5. The method of claim 1 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of 2-ethyl hexanol.

6. The method of improving refined wood pulp containing not over 0.15% of natural ether-extractable matter, of which less than 0.07% is oil-soluble unsaponifiable matter, which comprises adding to such refined wood pulp an ethylene glycol monoether of an aliphatic hydroxyl-substituted hydrocarbon having from 8 to 18 carbon atoms, and at least one compound of the group consisting of soap-forming fatty acids, soap-forming resin acids, and the water-soluble sodium salts of said acids, the amount of the monoether of the substituted hydrocarbon being such as not to cause said oil-soluble unsaponifiable matter to exceed about 0.07% based on the bone dry weight of the pulp, and the amount of the monoether of the substituted hydrocarbon and the member of said group added being such as not to cause the ether-extractable matter in the pulp to substantially exceed 0.15%, based on the bone dry weight of the pulp.

7. In the production of cellulosic products having an opacifying agent incorporated therein from wood pulp having not over 0.15% of natural ether-extractable matter, both saponifiable and unsaponifiable, of which less than 0.07% is oil-soluble unsaponifiable matter; the improvement which comprises adding to the wood pulp an ethylene glycol monoether of an aliphatic hydroxyl-substituted hydrocarbon having from 8 to 18 carbon atoms, the amount of such monoether of the substituted hydrocarbon being such that the total amount of ether-extractable, unsaponifiable matter in the wood pulp does not exceed about 0.07% based on the bone dry weight of the wood pulp, whereby in the subsequent processing of the pulp into the cellulosic product, said opacifying agent is dispersed in the cellulosic product without objectionable scum formation.

8. In the production of cellulosic products as defined in claim 7 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of 7-ethyl-2-methyl-undecanol-4.

9. In the production of cellulosic products as defined in claim 7 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of oleyl alcohol.

10. In the production of cellulosic products as defined in claim 7 in which the monoether of the substituted hydrocarbon is ethylene glycol monoether of 2-ethyl hexanol.

11. In the production of cellulosic products having an opacifying agent incorporated therein from wood pulp having not over 0.15% of natural ether-extractable matter, both saponifiable and unsaponifiable, of which less than 0.07% is unsaponifiable matter; the improvement which comprises adding to the wood pulp an ethylene glycol monoether of an aliphatic hydroxyl-substituted hydrocarbon having from 8 to 18 carbon

atoms and at least one compound from the group consisting of soap-forming fatty acids, soap-forming resin acids, and the water-soluble sodium salts of said acids, the amount of the monoether of the substituted hydrocarbon being such as the total amount of ether-extractable unsaponifiable matter in the pulp does not exceed about 0.07% based on the bone dry weight of the wood pulp and the total amount of the monoether of the substituted hydrocarbon and the member of said group added to the pulp being such that the total amount of ether-extractable matter in the pulp does not substantially exceed 0.15% based on the bone dry weight of the wood pulp, whereby in the subsequent processing into the cellulosic product, said opacifying agent is dispersed in the cellulosic product without objectionable scum formation.

12. A refined wood pulp containing natural and added ether-extractable saponifiable matter and ether-extractable oil-soluble unsaponifiable matter totaling not substantially over 0.15% based on the bone dry weight of the wood pulp, the added ether-extractable oil-soluble unsaponifiable matter being an ethylene glycol monoether of an aliphatic hydroxyl-substituted hydrocarbon having from 8 to 18 carbons atoms, the total amount of ether-extractable oil-soluble unsaponifiable matter in the pulp not substantially exceeding 0.07% based on the bone dry weight of the pulp, said pulp also containing at least one added compound from the group consisting of soap-forming fatty acids, soap-forming resin acids and the water-soluble sodium salts of said acids.

13. A refined wood pulp as defined in claim 12 in which the monoether of the substituted hydrocarbon added to the wood pulp is a compound selected from the group consisting of ethylene glycol monoether of 7-ethyl-2-methyl-undecanol-4, ethylene glycol monoether of oleyl alcohol, and ethylene glycol monoether of 2-ethyl hexanol.

14. A refined wood pulp as defined in claim 12 in which the added ether-extractable saponifiable matter is a compound from the group consisting of soap-forming fatty acids, soap-forming resin acids and the water-soluble sodium salts of said acids.

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