

Detergent Compositions For Washing AbrasivesField of the Invention

5 The present invention relates to a detergent composition for washing abrasive articles used for grinding or polishing wood products to remove wood residues having a high oil content.

10 Background of the Invention

Abrasive articles are widely used in grinding or polishing processes in steel, ship building, automobile, machine and lumber industries.

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Abrasive articles used in a process for grinding or polishing various wood products are generally in the shape of a sheet, and they are prepared by attaching abrasive particles or grains on one side of cloth or paper using
20 adhesives, e.g., gelatins or resins, and shaping into the form of a sheet, roll, belt or disk, suitable for mounting on various automatic polishing machines.

During the course of using such a polishing machine,
25 however, wood residues, such as wood dusts and oily components, became imbedded in between abrasive particles, rendering the abrasive articles unsuitable for further use. Accordingly, in order to prolong the use life of an abrasive article for wood products, the wood residues
30 imbedded thereon must be removed by washing, e.g., with

water or a detergent.

The present inventor has disclosed a detergent composition for removing wood residues remaining on abrasive articles in Korean Patent No. 95-11398. However, it was found that said composition is not effective in removing wood residues having a high oil content, when a normal washing condition is employed, and the combined use of a tool like a brush or high-pressure water jet becomes necessary, rendering the washing process complicated.

Summary of the Invention

Accordingly, it is one object of the present invention to provide an improved detergent composition for washing abrasive articles used for grinding or polishing wood products having a relatively high content of oily components to prolong the lifetime of the abrasive articles.

In accordance with the present invention, there are provided a detergent composition comprising 10 to 15% by weight of diethanolamine, 60 to 90% by weight of water and 25 to 30% by weight of propyleneglycol methylether. Preferably, the composition comprises 10 to 11% by weight of diethanolamine, 62 to 63% by weight of water and 26 to 27% by weight of propyleneglycol methylether.

Detailed Description of the Invention

Wood residues (grits) that stick on an abrasive

article during grinding or polishing wood include both wood dust and an oily component. The wood dust consists mostly of cellulose fibers, the smallest unit being a micelle having the approximate size of 0.05nm in diameter and 0.6nm in length. An X-ray analysis shows that the micelle is crystalline and the part between micelles is amorphous. When immersed in water or a dilute alkaline solution, the wood dust absorbs water and the fiber becomes expanded due to the permeation of water through the amorphous part.

When the expanded fiber is immersed in a strongly alkaline solution, water permeates further into the crystalline part, rendering the wood dust embedded on the abrasive article swollen, which is easy to remove by washing. Such a strongly alkaline solution can be prepared using, e.g., alkali metal hydroxides, carbonates, phosphates as well as amines and ammonia. Among these, amines are preferred, most preferably diethanolamine. When the amount of diethanolamine used is less than 10% by weight, the efficiency of removing the wood residues is not satisfactory, and when the amount of diethanolamine used is more than 15% by weight, the treatment cost became unfavorably high.

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The oily component of the grits prevents wood dust from getting wet and swollen by the action of the alkali. Therefore, the oily component, when it exists in a large amount, must be removed by adding to the washing solution an appropriate solvent component that can dissolve the oil.

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Examples of such solvents capable of dissolving the oily component include propyleneglycol methylether, ethylcellosolve and methanol, among which propyleneglycol methylether is most preferred. In the inventive composition, propyleneglycol methylether is used in an amount ranging from 25 to 30 wt%, preferably 26 to 27 wt% based on the total weight of the composition.

When the amount of propyleneglycol methylether used is less than 25% by weight, the grit removing efficiency is not satisfactory and when the amount of propyleneglycol methylether used is more than 30% by weight, further improvement of the removing efficiency is insignificant, while the process cost increases.

Examples

Preparation 1: Comparative composition

A detergent composition including 10% by weight of diethanolamine and 90% by weight of water was prepared.

Comparative Example

A 30m² wood (kapol) piece having an oil content of 5-7% by weight was ground continuously using an automatic grinding machine equipped with a circular coated abrasive band (50mm x 2100mm, particle size: P120). After 10 hours of abrasion, the sand paper was immersed in the comparative detergent composition for 10 minutes, washed

with running water, and dried at 50°C. The resulting coated abrasive could be used for polishing wood for additional 6 hours.

- 5 The above cleaning process was repeated to measure the lifetime of the coated abrasive, and the result is shown in Table 1:

Table 1

The number of cleansing	Cumulative use time (hrs)
0	10
1	16
2	19
3	21
4	22

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As shown in Table 1, the lifetime of the coated abrasive washed four times with the comparative composition was extended only by a factor of two to the extent 22 hours.

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Experiment 1: The alkaline component of the composition

- 20 The grinding procedure of Comparative Example was repeated for 10 hours and the fouled coated abrasive was washed using an aqueous solution containing a varying amount of alkali for 10 hours as shown in Table 2. The grit removal rate was calculated based on the following formula:

$$\text{Grit removal rate(\%)} = [W_2 - W_0] / [W_1 - W_0] \times 100$$

wherein, W_0 is the weight of the coated abrasive before grinding, W_1 is the weight of the fouled coated abrasive obtained after 10 hour grinding, and W_2 is the weight of the coated abrasive obtained by immersing the fouled paper in each solution for 10 minutes, washing with running water, and drying in a furnace at 120°C. The results are shown in Table 2:

Table 2

Alkali Conc.	Grit removal rate(%)			
	Sodium hydroxide	Ammonia	Diethanol amine	Liquid soap
5%	75.0	58.1	60.0	31.0
9%	83.5	68.5	66.7	33.7
10%	96.2	87.1	90.9	32.5
11%	95.3	91.0	90.9	34.9
15%	94.1	90.6	90.0	32.0

As shown in Table 2, the higher the alkalinity of the solution is, the higher the removal rate becomes. Although sodium hydroxide or ammonia exhibits a high removal rate, diethanolamine is more preferred because it is odorless and harmless. When the diethanolamine content in water is 10 to 15% by weight, the removal rate is more than 90%.

Experiment 2: The amine component of the composition

The procedure of Experiment 1 was repeated using each of the amine solutions shown in Table 3. The grit removal rates thus determined are shown in Table 3:

5 Table 3

Amine Conc.	Grit removal rate (%)		
	monoethanol- amine	diethanol- amine	triethanol- amine
5%	80.0	60.0	50.0
9%	83.3	66.7	57.1
10%	90.9	90.9	86.1
11%	89.6	90.9	85.9
15%	90.0	90.0	86.5

As shown in Table 3, the triethanolamine-containing composition is least effective, while monoethanolamine is as effective as diethanolamine, but is much more expensive
 10 than diethanolamine.

Experiment 3: The solvent component of the composition

10% by weight of diethanolamine and 90% by weight of
 15 each of the solvents listed in Table 4 were mixed and used in determining the grit removal rate as in Experiment 1. The results are shown in Table 4:

Table 4

	Water	Methanol	Ethylen eglycol	Propyleneglyco l methylether	Ethylcel losolve
Grit Removal rate (%)	90.9	88.1	80.3	98.2	98.2

As shown in Table 4, both ethylcellosolve and propyleneglycol methylether-containing solutions exhibit excellent removal rates. However, propyleneglycol is preferred, because ethylcellosolve is toxic. A mixed solution containing water is also effective as shown in Experiment 4, and thus, an aqueous solution containing diethanolamine and propyleneglycol methylether is most preferred in view of manufacturing costs.

Experiment 4: The mixing ratio of the components of the composition

10% by weight of diethanolamine was combined with 90% by weight of a mixture of water and propyleneglycol methylether with a varying mixing ratio as shown in Table 5, and the resulting solution was subjected to a grit removal rate measurement as in Experiment 1. The results are summarized in Table 5:

Table 5

	Propyleneglycol methylether : water mixing ratio				
	10:0	9:1	8:2	7:3	6:4
Grit Removal rate(%)	90.9	94.2	96.4	98.2	98.2

As shown in Table 5, when the mixing ratio of propyleneglycol methylether to water reaches 7:3, the removal rate increases to the highest value of 98.2%, and remains constant thereafter, was at a propyleneglycol methylether-rich ratio of 6:4. Therefore, an optimal economical mixing ratio of diethanolamine:propyleneglycol methylether:water is 10:27:63.

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Preparation 2: Inventive composition

Diethanolamine (11 wt%), water (63 wt%) and propyleneglycol methylether (26 wt%) were mixed to prepare a detergent composition.

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Example 1

Except for using the composition prepared in Preparation 2, the procedure of Comparative Example was repeated to obtain the result shown in Table 7:

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Table 7

The number of washing	Cumulative use time (hrs)
0	10
1	18
2	24
3	27
4	29
5	30

As shown in Table 7, the lifetime of the coated abrasive can be extended by a factor 3 when the coated abrasive is washed intermittently with the cleaning composition of the present invention, which should be compared with the much shorter lifetime prolongation by a factor of about 2 observed in Comparative Example for a composition consisting only of water and diethanolamine.

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While the invention has been described with respect to the specific embodiments, it should be recognized that various modifications and changes may be made by those skilled in the art to the invention which also fall within the scope of the invention as defined as the appended claims.



What is claimed is:

1. A detergent composition comprising 10 to 15% by weight of diethanolamine, 60 to 90% by weight of water and
5 25 to 30% by weight of propyleneglycol methylether.

2. The composition as claimed in claim 1, comprising 10 to 11% by weight of diethanolamine, 62 to 63% by weight of water and 26 to 27% by weight of propyleneglycol
10 methylether.