METHOD OF MAKING COATED ABRASIVES

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This invention relates to an improved method of making coated abrasive articles such as abrasive sheets, belts, discs, and the like.

One object of the invention is to provide an improved form of coated abrasives characterized by an unusual cutting ability and exceptionally long life. Another object of the invention is to provide a method for making an article of the character described. Still another object of the invention is to provide abrasive articles and the method of manufacturing the same comprising a backing coat with a substantially single layer of abrasive grains some of which are additionally coated with a second layer of grains whereby the coating will consist of areas covered by a substantially single layer of grains interspersed with clusters or mounds of additional grains attached to some of the first mentioned grains.

Coated abrasive articles have heretofore commonly been made by coating a backing material with an adhesive, distributing the abrasive grain over the surface of the adhesive, and then setting up the adhesive so as to attach the grains firmly to the backing. A second or sizing coating of adhesive is commonly applied over the surface of the abrasive grains to assist in attaching them to the backing.

We have found that an abrasive coated product having a cutting rate and an abrading life upwards of 30 to 50% greater than the life of the usual articles of this character can be made by first coating the backing with a restricted amount of grains and then adhesively coating the thus coated articles with additional abrasive grains.

We have illustrated our invention by a number of drawings wherein:

Figure 1 is a side elevation of a backing coated with abrasive grains and adhesive by the first step of our process;

Figure 2 represents the article of Figure 1 additionally coated with a layer of adhesive;

Figure 3 shows the article of Figure 2 additionally coated with a second layer of abrasive grains;

Figure 4 illustrates one form of a finished article made according to the invention.

Referring to the drawing, Figure 1 shows a backing 1 to a surface of which is attached abrasive grains 2 by an adhesive 3. In Figure 2, the article of Figure 1 has been additionally coated with a layer of adhesive 4. In Figure 3, an additional coating of abrasive grains 5 has been applied to the article of Figure 2 and in Figure 4 a final or sizing coating of adhesive 6 is shown applied to the article of Figure 3.

In carrying out the invention we commonly employ the conventional methods of applying the individual coats of adhesive and abrasive grains. Such a method is fully described and illustrated in a bulletin issued by the Canadian Bureau of Mines as No. 699 entitled "Artificial Abrasives and Manufactured Abrasive Products and Their Uses" (pp. 72 to 79). Briefly, the method comprises passing a web between a pair of rotating rolls, one of which is partially submerged in a vat of adhesive whereby a layer of adhesive 3 is applied to the backing material 1. A controlled and restricted amount of grain is then applied uniformly over the adhesive coated surface to form what is known in the art as an "open coating," the adhesive is hardened sufficiently to hold the grains to the surface, and the thus coated web is passed between a second pair of rotating rolls where the second coating of adhesive 4 is applied over the backing and over the tops of the grains 2. The thus coated web is then additionally coated with further abrasive grains 5 and is finally sized with the adhesive coating 6 in the manner described in connection with coatings 3 and 4. Following any or all of the applications of adhesive the coated web may be suitably treated to harden the adhesive.

While it is customary to apply the adhesive and the abrasive grains in the manner thus described, we sometimes find it convenient to apply one or more of the coatings by other methods such as by spraying or by brushing on the adhesive.

Furthermore, we have sometimes found it convenient to apply the third coating about the abrasive granules before they are put on the backing. This application of adhesive may be put on by either mixing the abrasive grains with a liquid adhesive or the grains may be covered with a layer of solid adhesive by any of a number of well known methods.

While most abrasive coated products are at present made with glue as the adhesive, our invention can be adapted to a variety of other adhesives such as resins, modified rubber, or other suitable adhesive material. These materials may be in the form of solutions, colloids, suspensions or dispersions, or they may be normally liquid materials which are heat hardenable such as certain phenolic condensation products which are liquid when first reacted but which are con-
verted to a solid condition by heating or other treatment.

The abrasive grains may be any of the types commonly employed such as silicon carbide, fused alumina, garnet or flint, and we have sometimes found it useful to employ different kinds of grains for the two coatings.

We have found that articles made in accordance with our invention are unusually fast cutting and have unusually long abrading life, even with a weight of abrasive coating not materially greater than the weight of coating commonly employed by the older methods. Both the cutting rate and the abrading life are commonly found to be from 30 to 50% greater than the rate and life of articles made by the conventional method and carrying the same total weight of abrasive grains per unit of area.

We usually apply from about 15 to 25% of the total weight of abrasive grain in the first or open coating of grains 2 and the remainder in the second coating of grains 5. We have found that such proportions of the weights of coatings are satisfactory.

Upon examination our articles appear to contain mounds or clusters of grains formed about the grains applied in the first coating, interspersed with areas carrying a single layer of grains which are attached directly to the backing. Apparently this particular construction of the abrasive coating provides clearance spaces for the stock removed by the grains when the articles are used. As stated, the articles are very fast cutting and they are unusually sharp to the touch. They feel like articles made with coarse grits but develop the surface characteristic of the particular grit size employed.

While we have described and illustrated our invention with reference to certain embodiments, it is to be understood that other modifications may be employed as defined by the appended claims.

We claim:

1. In the method of making abrasive coated products the steps which comprise coating a backing material with a layer of adhesive, applying an open coating of abrasive grains to the adhesive coating so as to leave a substantial proportion of the adhesive uncoated with the grains, and then additionally coating the coated surface with adhesive and a secondary coating of abrasive grains, whereby the coated surface comprises uniformly distributed areas coated with single abrasive grains interspersed with areas coated with clusters containing a plurality of grains.

2. In the method of making abrasive coated products the steps which comprise first coating a backing with a substantially uniformly distributed open coating of abrasive grains so as to leave a substantial proportion of the backing uncoated and then adhesively attaching a second coating in an amount sufficient to substantially cover the previously uncoated parts of the backing and the grains which were first applied, whereby the coated surface comprises uniformly distributed areas coated with single abrasive grains interspersed with areas coated with clusters containing a plurality of grains.

3. In the method of making an abrasive article the steps which comprise coating a backing material with an adhesive, applying a limited amount of abrasive grain to the adhesive coating so as to coat only a minor proportion of the surface with grain substantially uniformly distributed as an open coating, applying a second coating of adhesive to the coated side of the backing and then applying additional abrasive grain in a quantity sufficient to substantially completely cover both the adhesive surface and the first coating of abrasive grains.

4. In the method of making an abrasive article the steps which comprise coating a backing with an adhesive, applying a substantially uniformly distributed open coating of abrasive grains to the backing in an amount sufficient to cover not more than about 25% per cent of the surface of the backing, applying a second coating of adhesive to the thus coated backing, and then applying an additional coating of grains to the coated backing, whereby the coated surface comprises uniformly distributed areas coated with single abrasive grains interspersed with areas coated with clusters containing a plurality of grains.

5. In the method of making an abrasive article the steps which comprise coating a backing material with an adhesive, applying a substantially uniformly distributed open coating of abrasive grain to the adhesive coating so as to coat only a minor proportion of the surface with grain, applying a second coating of adhesive to the coated side of the backing, applying additional abrasive grain in a quantity sufficient to substantially completely cover both the adhesive surface and the first coating of abrasive grains, and finally applying a third coating of adhesive over the grain covered surfaces.

6. In the method of making an abrasive article the steps which comprise coating a backing material with an adhesive, applying a substantially uniformly distributed open coating of abrasive grain to the adhesive coating so as to coat only a minor proportion of the surface with grain, applying a second coating of adhesive to the coated side of the backing and then applying additional abrasive grains which have been preliminarily provided with coatings of solid adhesive, said additional coating being made in a quantity sufficient to substantially completely cover both the adhesive surface and the first coating of abrasive grains.

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