Abrasive Tools and Methods of Making and Using Same


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This invention relates to abrading tools such as honing stones and to methods of making and using tools of this type.

One of the prime objects of the invention is to provide an abrasive machining element of improved character having a uniformly wearing or disintegrating matrix carrying the abrasive grains which is particularly well suited to precision abrading operations such as honing.

Present commercial honing stones employ vitrified glass or a thermosetting resin matrix to bond the abrasive cutting particles and because of the considerable variation in the physical structures of their matrices such tools have not been consistent in their abrading action. Further such abrasive elements are not well suited to low temperature cutting because of their low thermal conductivity and the lack of lubrication within the tool itself, and the abrading surfaces tend to "load up" with particulate matter as the tool heats up during the machining operation.

Another object of the present invention is to provide a physically uniform abrasive body, having good thermal conductivity characteristics, which can be used to machine relatively thin sections without heating them to the range where distortion occurs.

Another object of the invention is to provide an abrasive body of the character described which is self-lubricating so that build-up of heat due to friction tends to be minimized.

A further object of the invention is to provide an abrasive body having a clean, uniform abrading action which is well suited to automatic machining operations.

A still further object of the invention is to provide a honing tool having a matrix which is capable of damping vibrations created during the honing operation and provides a steadier abrading action enabling greater accuracy to be obtained.

Another object of the invention is to provide an abrading element of improved character which can remove material from the workpiece much more efficiently than conventional abrasive bodies employing identical abrasive grains.

Still a further object of the invention is to provide a method of making an abrasive tool of the type described which permits a good control of the cutting characteristics of the tool.

A further object of the invention is to provide an abrasive tool which can be strengthened by compounds formed by the reaction of additives with the bond or abrasive grain in a manner to permit the controlled variance of the rate of wear or progressive break-down of the matrix.

Another object of the invention is to provide an abrasive tool such as described having abrasive grains which may be formed by chemical reaction with the matrix if desired.

Another object of the invention is to develop a carbon bonded abrasive tool and a process of forming such a tool which is economical and practical in nature.

A further object of the invention is to provide a highly efficient and reliable abrading tool of strong and rugged construction which is capable of resisting high compressive forces, and which is well suited for machining ferrous and non-ferrous metals, and various non-metallic bodies.

A still further object of the invention is to provide an abrasive tool, having a clean cutting action capable of producing a bright, lustrous, high precision finish, which can be operated at increased abrading speeds, if desired.

These and other features of the invention, and the novel method referred to will be more fully apparent from the following description and will be particularly pointed out in the appended claims.

In the drawing:

FIG. 1 is a schematic elevational view illustrating an embodiment of the invention in which honing stones are constructed in accordance with the invention are employed to machine a cylinder.

FIG. 2 is an enlarged cross-sectional view of one of the stones taken on the line 2—2 of FIG. 1.

FIG. 3 is a similar cross-sectional view illustrating the composition of a slightly modified stone.

FIG. 4 is another cross-sectional view illustrating the composition of still another stone, and;

FIG. 5 is a similar cross-sectional view illustrating the composition of a stone wherein the abrasive grains are formed by chemical reaction.

Referring now more particularly to the drawings, wherein we have schematically shown the honing head of a conventional type honing machine, a numeral generally indicates replaceable honing stones which are shown supported by holder elements. In machines of this type an automatically controlled, axially movable member, having a conical surface, continuously feeds the circumferentially disposed honing stones into the bore of a work piece W at a slow and uniform rate. During the honing operation the head and the honing stones which it carries is continuous revolved and is simultaneously reciprocated in an axial direction in the usual manner, so that the stones during this particular machining operation are in a state of compression. The instant invention is concerned with the composition of the abrading element or stone, and the methods of making and using the elements accordingly the honing operation briefly described is set forth for purposes of illustration only and it is to be understood that other abrading or cutting actions might as easily have been depicted.

In the species of the invention disclosed in FIG. 2 uniformly dispersed, abrasive grains are shown bonded in a carbon-graphite matrix. When a stone of such composition is employed, the disintegration of the matrix is uniform and, as the matrix wears away, the dulled partially exposed abrasive grains are torn out by the friction developed and the underlying grains are exposed to continue the cutting action. It is highly desirable that the partially exposed abrasive grains drop out and be replaced prior to the time that their exposed cutting edges are dulled sufficiently so that they contribute little to the abrading action. Further it is desirable in automatic abrading operations that the rate of disintegration of the matrix be uniform so that as the abrading operation proceeds approximately the same amount of material is removed from the workpiece per unit of time.

The carbon of carbonaceous matrix or bond provided is a solidified, carbon bonded, carbon-graphite mixture in which the abrasive grains are uniformly dispersed. By a carbon-graphite mixture is meant a mixture of graphite, which technically is elemental carbon, of course, and any other non-graphitic form of carbon. Particles of aluminum oxide, silicon carbide, diamond, titanium, diboride, boron carbide, tungsten carbide, titanium carbide, carbodienu carbide, chromonium carbide and other abrasive grains of relatively greater hardness than the matrix composition may be used to provide the abrading actions.
The carbon-graphite matrix illustrated in FIG. 2, which is of a hard, baked character, is formed from a raw mixture of coal tar pitch and pelourent, amorphonous, natural graphite in a manner to be presently described. The mixture has been found to produce a satisfactory matrix if the mixture provides 20-70 parts by weight of pitch to 80-30 parts by weight of graphite. To provide a high strength matrix of good quality for honing or abrading the composition is preferably at least 30% pitch by weight and ideally will be 45-50% pitch by weight. If the pitch content is greater than 70% by weight the body formed may shrink and crack, and exhibit other undesirable characteristics. The pitch and graphite are placed in a steam jacketed, intensive mixer of the double sigma type and thoroughly blended while being heated relatively slowly to a temperature of approximately 165°C. As the composition is being heated, the constituents of the composition are intimately blended by the mixer.

The pitch melts when a temperature of about 110°C is reached and thereafter certain liquid hydro-carbons are distilled from the pitch until such time as a solidified mass is removed from the mixer. In this solidified state the natural graphite and the pitch residue are thoroughly blended into a homogenous mass which has been physically reversed from a relatively liquid to solid state, however, the pitch residue still contains hydrocarbons which at high temperatures less than 165°C will liquefy and "swell" the graphite. The mass is then finely pulverized and screened after which the abrasive grains are to be used and thoroughly blended into the ground mixture. While the size of the pulverized mix particles and abrasive grains is variable to suit particular abrasive operations, a mixture consisting of abrasive grains up to 600 mesh blended with 100-200 mesh particles of the phase reversed mix provides a very satisfactory composition. The blend of mix and grain will be in the ratio of 10-50 parts by weight of mix to 80-10 parts by weight of abrasive grains. The blend should be at least 10 parts abrasive to obtain an abrasive action from the tool to be formed. A composition which provides 40-60 parts by weight of abrasive grains to 40-60 parts by weight of phase reversed mix has been found to be very satisfactory for most purposes. From a practical standpoint if more than 60% abrasive grain by weight is used, honing results with the tools formed are not improved and with some abrasives the use of more than 60% results in less efficient honing of decreased quality. Accordingly for most purposes the phase reversed pitch and graphite mix content should be at least 4%.

When used, the abrasive mix is placed in a die cavity in a conventional mold, which is molded, and is molded under a pressure of 10 to 30 tons per square inch into an abrasive tool. In the instant case the honing stones shown are formed but other abrasive tools may, of course, be formed in a similar manner.

When the stones or tools are removed from the press they are baked slowly in an oven which has an inert atmosphere at a relatively high temperature. During this baking operation the pitch is, of course, heated at least to its carbonization range and in the process of being reduced to free carbon thoroughly bonds the constituents including the abrasive grains. The baking process is slow and may continue for 12 hours or more as the tools are slowly brought to the desired temperature which is usually in the range 475-2200°C. Such temperatures will provide a good carbonization of the pitch without causing deterioration of the abrasive grains. Preferably the range used is 500°C to 1350°C (1000 to 2500°F) to insure a thorough carbonization of the pitch and provide a strong free carbon bond. When aluminum oxide grains are used the temperature should not go appreciably above 1400°C.

The tool or stone when completed is of a hard, rigid character and in a broad sense the matrix 15 serves as a bond for the relatively harder abrasive grains 14 which are uniformly dispersed throughout the matrix. By uniform dispersion we mean a substantially even arrangement of the grains in the matrix, whatever their size, as obtained by making the tool in the manner described. The graphite, which is the filler, and the free carbon reduced from the pitch, which is a more specific sense serves as the bond for both the graphite and grains, and are both in an amorphous state. Graphite makes an excellent filler or vehicle because it is chemically inert at the temperatures mentioned and will not react chemically with the abrasive grains, and because the graphite is highly thermally conductive and the heat generated in the abrading action is rapidly dissipated. In fact a tool of the character described is up to ten times more thermally conductive than the similar tools in present use. For this reason the exposed grains do not fuse with the metal dust removed and tend to be dulled accordingly because the heat is rapidly conducted away from the abrading surfaces. This latter factor is important from the standpoint of achieving uniformity of disintegration of the stone in service although it is believed that other characteristics of the matrix described contribute to the result also. If other materials such as petroleum coke or silica, or other natural or synthetic graphites, are used as the filler in place of the graphite, improved tools are obtained from the standpoint of comparison with conventional tools because of the more uniform disintegration of the temper carbon by the free carbon, however the graphite filler is preferred. If silica is used as the filler the carbonization of the pitch carbon should be accomplished in the minimum carbonization range at about 475-1100°C.

Coal tar pitch is believed to be the most satisfactory raw agent for providing the binder carbon. However, other compounds containing carbon in a combined state which have the property of wetting the graphite or filler for suitable temperatures such as referred to previously, and which can be carbonized to free carbon without leaving any appreciable impurities at a suitable temperature such as referred to previously, may be used. Various tars, pitches, chlorinated paraffins, and other hydrocarbon type compounds may be employed, and other carbon compounds meeting these conditions will be satisfactory.

An abrasive tool formed in the manner described may in structure be as much as 20% voids and it may be desirable to provide a more dense tool. This can be accomplished through use of carbon fines in the form of lampblack, for example, in the initial mix. A highly satisfactory initial mix may, for instance, consist of 30-50% coal tar pitch by weight, 40-60% amorphous natural graphite by weight, and oil-soluble lampblack by weight. Further, after being removed from the forming oven the tool is impregnated with a dilute phenol formaldehyde resin in a liquid state or other resin in any suitable manner such as by forcing the resin into the tool under pressure. Thereafter, the resin in the impregnated tool may be relatively slowly cured in situ at temperatures up to 180°C. This procedure introduces the resin to the voids in the amount of up to 12% by weight which is not sufficient to materially affect the uniformity of disintegration or wear of the matrix or its high thermal conductivity.

The efficiency or performance of a honing stone formed in the manner described may be measured by comparing what may be termed its "volumetric ratio of removal" for a given diameter of bore with that of conventional stones. By the "volumetric ratio of removal" is meant the amount or volume of workpiece material removed or abraded away as compared with the amount or volume of material worn from the tool. Ideally this ratio should be constant during the service life of the tool if the same machining operations are being performed. However, commercial honing stones do not provide constant "ratios" at all. Any one tool may have a "ratio" varying from 10-1 to 25-1 at various times and the average
might be about 17 cubic inches of material removed for every cubic inch of stone removed.

Stones made in accordance with the disclosure of the present invention are characterized by a uniform "ratio of removal" and further with the addition of certain chemically reactive additives to the mixture, prior to the forming of the tool, in press, can be provided with the particular "volumetric ratio of removal" desired. In the machining of various workpieces tools having particular "ratios of removal" will perform the abrading operation better than others and provide the surface finish and precision desired. Thus, if a stone can be provided which has a relatively uniform "ratio of removal" it can be specified with some degree of confidence for a particular operation. The value of being able to consistently produce stones which in service will have the "ratio of removal" desired without testing each one will also be apparent.

A very important aspect of the instant invention lies in being able to control the "ratio" a particular stone will have without varying the basic constituents of the stone or the method of making it, and in being able to produce stones which will have a much larger uniform "ratios of removal" as desired. This control is effected by adding certain materials to the mix at the time the abrasive grains are blended which will chemically react with the carbon in the matrix or with the abrasive grains. If the additive reacts with the carbon in the matrix, compounds of molecular size such as at 16 (FIG. 3) are formed which are dispersed uniformly throughout the carbon-graphite matrix. However, if the additive reacts with the grain, compounds of molecular size 17 (FIG. 4) are formed on the surface of the abrasive grains. These compounds strengthen the bond without materially affecting the uniformity of disintegration or wear of the tool but materially affect the volumetric "ratio of removal" of the tool in service. When the reaction is with the matrix carbides as at 16 (FIG. 3), the bond itself is strengthened and when the reaction occurs at the surface of the abrasive grains a better gripping surface on the smooth grains is believed provided for the bond material which strengthens the link between the bond and grains. By adding controlled amounts of certain additives to the matrix compounds, a reaction of the matrix carbides where the reaction takes place with abrasive grains such as silicon carbide other compounds such as silicides may be formed. These solid state reactions will take place when the reacting elements are in a solid phase occur during the baking cycle when the stones with the additives react with the other constituents uniformly dispersed throughout the matrix are brought up slowly to relatively high temperatures. When metals, or metal compounds, such as (1) silicon, (2) silicon containing 1-10%, (3) copper, and (4) chromium are added to the carbon-graphite mix described at the same time silicon carbide abrasive grains are added, with the additive in the proportion of 1% by weight of the mix to 25% by weight of the mix, the following solid state reactions are believed to occur to obtain the following water insoluble carbides or silicides in a very fine molecular size.

$$\begin{align*}
\text{(1)} & \quad \text{Si-C} \rightleftharpoons \text{SiC} \\
\text{(2)} & \quad \text{Si-SiC} \rightleftharpoons \text{Si-Si} \\
\text{(3)} & \quad \text{Cu-C} \rightleftharpoons \text{CuSi} \rightleftharpoons \text{C} \\
\text{(4)} & \quad \text{Cr-C} \rightleftharpoons \text{CrC}
\end{align*}$$

The above reactions are intended to be illustrative of additives which may be employed with tools of the novel character described in which silicon carbide is used as the abrasive. In the first example there is a solid state reaction between the bonding carbon and the silicon at the high temperatures mentioned. Also the presence of silicon at the grains will create an interphase condition in which silicon carbide of the grain is in solid phase solution in an excess of silicon at the grain at the high temperatures mentioned. When the temperatures are decreased, it solidifies in this interphase state to provide a better link between the bond and the grain. Silicon carbide stones such as described are well suited to the abrading of cast iron and in practice have been able to hone more than twice as many cylinders as conventional stones of the same size. If the additive employed is chromium, titanium hydride, or zirconium hydride, the reaction is with the bonding carbon in the matrix as is the case in Examples 1, 2, and 4 and carbides are formed. The additive should be an element or a compound containing such elements which will react with carbon to provide a water insoluble carbide or react with silicon, boron or other such elements in the abrasive grain to provide a water insoluble silicide, boride, nitride, or the like to permit control of the volumetric "ratio of removal" and the strength and rate of wear of the bond. The volume of additive used is preferably kept under 25%, since otherwise the abrasive grains are not properly released by the matrix when they become dull and the abrading action is poor. It is possible for instance to have provided a honing stone which has a "volumetric ratio of removal" of 140-1 following the method described if near maximum amounts of additives are used. While We have mentioned metallic additives it will be possible to use non-metallic inorganics which would chemically react with the matrix or the grain to provide stable compounds.

When aluminum oxide abrasive grains are employed for machining surfaces such as steel similar additives including silicon are used. This results in the formation of aluminum silicide at the surfaces of the grains as well as silicon carbide in the bond. Also the addition of chromic oxide has been found to strengthen the link between the grains and bond.

Another aspect of the invention lies in the concept of forming the abrasive grains in the matrix by chemical reaction so that it is unnecessary to mix in abrasive grains. Thus in the process described, if at the time the abrasive grain was formerly blended with the mixture prior to the molding operation enough additive is mixed in to chemically react with elements in the matrix during the baking of the molded element at an elevated temperature, a stone or tool is formed wherein the hard compounds formed can function in place of the abrasive grains. Such a tool is satisfactory for abrading various materials.

For instance, if sufficient silicon metal is added the reaction of the silicon with the amorphous carbon in the matrix provides silicon carbide particles dispersed uniformly throughout the relatively softer matrix. The additive employed must, of course, be reactive with an element in the composition to form dispersed compounds which are relatively harder than the matrix or body in which the compounds are dispersed.

If titanium hydride and boron carbide are added in sufficient quantity the reaction will produce titanium diboride particles in the carbon-graphite matrix to function as the cutting particles. In both cases mentioned the tool pressed out is heated to sufficient temperatures for the chemical reaction to take place. In FIG. 5 the grains formed are shown at 18 in matrix 15.

While it is possible to provide sufficient hard grains within the carbon-graphite matrix by solid state chemical reaction as described to provide a product which is well suited to use as an abrasive tool bodies formed in this manner with dispersed molecular size compounds may also be used for other purposes.

As examples of the described product and method the following will yield satisfactory results and the proportions mentioned are by weight unless otherwise indicated.

Example 1

A carbon-graphite mix containing 45 parts of coal tar
pitch and 55 parts of amorphous natural graphite is phase reversed at 165° C., cooled, and finely pulverized to 200 mesh. It is then blended with 100 mesh silicon carbide abrasive grains in a ratio of 50 parts mix to 50 parts grain. This powdered and intimately blended composition is then pressed into a honing stone 3/8" by 3/8" by 3/4" in a press using a pressure of 15 tons per square inch at the die cavity. This article is baked slowly in a furnace with an inert atmosphere at a temperature gradually increased to 1200° C. over a period of 14 hours. The tool formed was found to be highly satisfactory for honing cylinders in cast iron blocks.

**Example 2**

The composition and method employed in Example 1 except that alumina grains were used in place of the silicon carbide grains and the tool was found to be very satisfactory for honing steel tubing.

**Example 3**

The composition and method employed in Example 1 except that silicon metal in the amount of 5 parts to 95 parts of the phase reversed mix-abrasive grain is added with the abrasive grain.

**Example 4**

The composition and method employed in Example 1 except that petroleum coke is used in the place of the graphite as the filler.

**Example 5**

The composition and method employed in Example 1 except that silica is used in the place of the graphite as the filler and the baking cycle is carried out at temperatures no greater than 1100° C. instead of up to 1200° C.

**Example 6**

The composition and method employed in Example 1 except that instead of adding abrasive grains in the amount indicated silicon metal is added in the amount of 40 parts to 60 parts of the carbon-graphite mix to form the abrasive grains by chemical reaction.

**Example 7**

The composition and method employed in Example 1 except that instead of adding abrasive grains in the amount indicated pulverulent titanium hydride and boron carbide in equal parts and constituting 40 parts of the mixture to 60 parts of the carbon-graphite mix are added to form titanium diboride abrasive grains uniformly dispersed in the matrix. The baking temperatures in this instance are carried out at temperatures up to 2200° C. instead of 1200° C.

**Example 8**

The composition and method employed in Example 1 except that aluminum oxide grains are used in the place of the silicon carbide grains and pulverulent silicon metal in the amount of 10 parts to 90 parts of the phase reversed mix-abrasive grain is added with the abrasive grain.

**Example 9**

The composition and method employed in Example 1 except that aluminum oxide grains are used in place of the silicon carbide grains, anthracene is used in place of the coal tar pitch, and pulverulent chromium oxide in the amount of 10 parts to 90 parts of the phase reversed mix-abrasive grain is added with the abrasive grain.

**Example 10**

The composition and method employed in Example 1 except that pulverulent copper in the amount of 20 parts to 80 parts of the phase reversed mix-abrasive grain is added with the abrasive grain.

**Example 11**

The composition and method employed in Example 1 except that 10 parts of zinc to 90 parts of the graphite filler are added to the coal tar pitch as the filler in the proportion of filler to pitch mentioned and pulverulent iron in the amount of 10 parts to 90 parts of the phase reversed mix-abrasive grain is added with the abrasive grain.

**Example 12**

A grinding wheel about two inches in diameter was made up in accordance with Example 1 and found to be very satisfactory for grinding cast iron workpieces to size. The cut was clean and smooth and the abraded surface did not tend to "load up."

**Example 13**

The composition and method employed in Example 1 except that Hercules Powder Co. Clarafin 40 was used in place of the coal tar pitch in the amount of 60% graphite.

The coal tar pitch preferred and used is a high melting range pitch obtained from the Barrett Division of Allied Chemical and Dye Corporation which has a high coking value. This pitch has a free carbon content of 27–32%, a coking value of 40%, and an ash content of less than 1%. It melts at temperatures between 206–218° F. and is broken down to particles less than 3/4" in size before being mixed with the graphite. The graphite preferred and used is the Mexican type designated No. 205 by the supplier, United States Graphite Division of the Wickes Corporation, which is about 95% carbon and is guaranteed to contain less than 15% ash. It is used in particles sizes of 100 mesh or finer and preferably its particles will be 200 mesh in the form in which it is mixed with the coal tar pitch.

The high strength of the stone is due partly to the phase reversing step described wherein the more volatile hydrocarbons are removed from the pitch at a temperature of 165° C. in the double sigma type mixer. The resulting solidified composition when removed from the mixer is denser and less porous than if these hydrocarbons were not removed. Also the extreme pressures used in compacting the stones which are measurable in tons per square inch provide stones of higher strength. The high strength which is necessary to abrasive stones is maintained at optimum levels also by the use of proper fillers. Amorphous graphite is much preferred to crystalline graphite which when used in the place of the amorphous natural graphite does not provide a stone suitable for abrasive stone operations. The material used as the filler must have certain other characteristics in addition to providing a high strength stone, of course. It must be chemically inert at the temperature at which the tool is baked and must be highly thermally conductive. In addition to graphite, petroleum coke, and silica, zircon, zirconia, and various mixes of these materials have these latter properties and may be used as the filler material but are not as suitable as amorphous natural graphite.

The strength of the stone may be varied by varying the amount of time the stone remains in the oven. The stones may be removed for instance before carbonization is entirely complete. Generally the stones are brought slowly up to temperature for 12 hours, remain at temperature for two hours or so and then are brought slowly down in temperature again for several hours prior to removal.

When an artificial resin such as phenol formaldehyde is forced into the remaining voids in the stone after the stone is removed from the oven the strength of the stone is also affected. Filling of the voids in this manner, through use of a resin which can be thinned and forced in, of course, tends to increase the strength of the stone. The compound used may be Monsanto #410 water soluble phenolic resin, an epoxy resin, shellac, or something equally suitable.
The above examples are included herein to illustrate various forms of the invention, however, it is to be understood that equivalents may be used within the spirit of the invention and the specification is in all cases to be interpreted as illustrative of the invention rather than as limiting the same in any way.  

What is claimed is:

1. An abrading tool consisting essentially of a uniformly wearing, strongly bonded, non-graphitic carbon matrix, about 10 to 90 weight percent of abrasive grains which are of greater hardness than the matrix and are uniformly dispersed in the matrix, and filler selected from the group consisting of graphite, petroleum coke, and silica which is chemically inert to the grains.

2. The tool of claim 1 wherein the non-graphitic carbon matrix is prepared from hydrocarbon materials selected from the group consisting of tar pitch, anthracene and paraffins.

3. An abrading tool consisting essentially of a uniformly wearing, strongly bonded, non-graphitic carbon matrix, thermal conducting amounts of graphite uniformly dispersed therein, and about 10 to 90 weight percent of abrasive grains uniformly dispersed in the matrix, the grains being of greater hardness than the matrix.

4. The tool of claim 3 wherein the grains are selected from the group consisting of aluminum oxide, silicon carbide, and titanium diboride, and the graphite is present in an amount of about 30 to 80 percent based on the weight of the carbon matrix and graphite.

5. The tool of claim 4 wherein the non-graphitic carbon matrix is prepared from hydrocarbon materials selected from the group consisting of tar pitch, anthracene and paraffins.

6. An abrading tool consisting essentially of:

(a) a uniformly wearing, strongly bonded, non-graphitic carbon matrix;

(b) about 10 to 90 weight percent of abrasive grains which are of greater hardness than the matrix and are uniformly dispersed in the matrix, and

(c) filler which is chemically inert to the grains, the carbon matrix and filler being present in an amount of about 20 to 70 parts by weight of the carbon matrix to about 80 to 30 parts by weight of filler; said tool having been prepared in the presence of metal additive which will chemically react with one of the carbons in the matrix and the abrasive grains during the preparation of the tool.

7. The tool of claim 6 wherein the metal additive is present in an amount of 0.1 to 25 weight percent based on the weight of (a) and (c).

8. The tool of claim 7 wherein the metal additive is selected from the group consisting of silicon, chromium oxide, copper, zinc, iron and their mixtures.

9. The tool of claim 8 wherein the non-graphitic carbon matrix is prepared from hydrocarbon materials selected from the group consisting of coal tar pitch, anthracene, and paraffins; the abrasive grains are selected from the group consisting of aluminum oxide, silicon carbide and titanium diboride; and the filler is selected from the group consisting of graphite, petroleum coke, and silica.

10. A method of preparing an abrading tool having a uniformly wearing, strongly bonded carbon matrix and about 10 to 90 weight percent abrasive grains which are uniformly dispersed in the matrix and are of greater hardness than the matrix; the steps comprising intimately blending solid hydrocarbon, filler and abrasive grains, compressing the blend into a rigid body, and slowly baking the body in an inert atmosphere at a temperature from about 475 to 2200° C. to dehydrogenize the hydrocarbon to form a carbon matrix and bond the grains to the matrix.

11. A method for preparing an abrading tool consisting essentially of a uniformly wearing, strongly bonded non-graphitic carbon matrix, about 10 to 90 weight percent of abrasive grains which are of greater hardness than the matrix and are uniformly dispersed in the matrix, and filler which is chemically inert to the grains and becoming present in an amount of about 30 to 80 weight percent based on the weight of the carbon matrix and filler; the steps comprising intimately blending solid hydrocarbon, filler and abrasive grains, compressing the blend into a rigid body, and slowly baking the body in an inert atmosphere at a temperature from about 475 to 2200° C. to dehydrogenize the hydrocarbon to form a carbon matrix and bond the grains and filler to the matrix.

12. The method of claim 11 wherein the filler is selected from the group consisting of graphite, petroleum coke, and silica, and the hydrocarbon is selected from the group consisting of tar pitch, anthracene and paraffins.

13. The method of claim 12, wherein the abrasive grains are selected from the group consisting of aluminum oxide, silicon carbide and titanium diboride.

14. The method of claim 11 wherein the hydrocarbon is coal tar pitch and the filler is graphite and the pitch, graphite and abrasive grains are intimately blended by intimately blending a mixture of pitch and graphite at a temperature above the melting range of the pitch to vaporize liquid hydrocarbons and leave a solid mass of blended pitch and graphite, pulverizing the mass and intimately blending the pulverized mass with abrasive grains.

15. The method of claim 11 wherein metal additive which will chemically react with one of the carbons in the matrix and the abrasive grains is incorporated in the blend and reacts under the baking conditions.

16. The method of claim 15 wherein the additive is added in an amount from about 0.1 to 25 weight percent based on the weight of the carbon matrix and the filler, and is selected from the group consisting of silicon, chromium oxide, copper, zinc, iron and their mixtures.

17. The method of claim 16 wherein the non-graphitic carbon matrix is prepared from hydrocarbon materials selected from the group consisting of tar pitch, anthracene and paraffins, and the filler is selected from the group consisting of graphite, petroleum coke, and silica.

18. The method of claim 17 wherein the abrasive grains are selected from the group consisting of aluminum oxide, silicon carbide and titanium diboride.

19. The method of claim 18 wherein the hydrocarbon is coal tar pitch, the filler is graphite; the pitch, graphite, abrasive grains and metal additive are blended by intimately blending a mixture of pitch and graphite at a temperature from about 110 to 165° C. to vaporize liquid hydrocarbons and leave a solid mass of blended pitch and graphite, pulverizing the mass and intimately blending the pulverized mass with the abrasive grains and metal additive; and the baking is effected at temperatures from about 1150 to 1350° C.

20. The abrading tool of claim 3 wherein the grains are greater than 600 mesh in size.

21. The method of claim 12 wherein the grains are greater than 600 mesh in size.

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