belongs. The materials, methods, and examples are illustrative only and not intended to be limiting. To the extent that certain details regarding specific materials and processing acts are not described, such details may include conventional approaches, which may be found in reference books and other sources within the manufacturing arts.

Embodiments disclosed herein are directed to an abrasive article including a body including a bond material and abrasive particles contained within the bond material. The body can further contain pores and a coating. The coating can include a polymeric material and can cover at least a portion of the pores. The coating may provide the advantage of increasing the strength of the bond material and protecting the bond material from corrosion and deterioration when exposed to coolant fluids, specifically water-based coolants.

The bonded abrasive article described in embodiments herein can be suitable for various grinding operations including, for example, for finishing of hardened steel parts, such as cam and crank shafts, finishing of hydraulic components used in internal combustion engines, bearings, fuel injector components and preparation of carbide cutting tools.

The body can have a plurality of interconnected pores formed by the abrasive particles and the bond material. **FIG.1** illustrates a body (101) of an abrasive article according to an embodiment of the present disclosure, including abrasive particles (102) held together with a bond material (103), wherein the voids between the abrasive particles and the bond material define pores (104) within the body. The body (101) can further contain a coating (105) which can cover at least a portion of the exterior surface of the body. As used herein, the term "exterior surface of the body" relates to the complete surface structure of the body, including the surface of the voids (pores) formed by the bond material and the abrasive particles. The applied coating (105) may be suitable to improve the performance of the bonded abrasive, including, but not limited to, providing suitable protection of the bond material (103) from damaging influence of a coolant.

The present disclosure further relates to a method of making the bonded abrasive article. In one embodiment, a bonded abrasive comprising a body can be provided and may be coated by conducting a vapor deposition process under vacuum.

Unlike traditional infiltration processes, which seek to close the porosity within the body via an infiltrant, the bonded abrasive articles herein can maintain a certain permeability with the coating, which may improve the performance of the bonded abrasive. In one embodiment, the

The coating of the present disclosure can cover the surface of at least a portion of the pores of the body and may not completely fill the pores or close the pore openings, thereby maintaining at least partially an interconnected open pore structure of the body. In a particular aspect, the coating can define a capillary void space extending through at least a portion of the pores.

In one embodiment, the body may include a certain content of open porosity, which can define an interconnected network of pores extending throughout the body and be distinct from closed porosity, which is defined as discrete and isolated pores contained entirely within the body. In embodiments, the body can include at least 5 vol% open porosity for a total volume of the body, such as at least at least 10 vol%, or at least 15 vol%, or at least 20 vol%, or at least 25 vol%, or at least 30 vol%, or at least 35 vol%, or at least 40 vol%, or at least 45 vol%, or at least 50 vol%, or at least 55 vol%, or at least 60 vol%, or at least 65 vol%, or at least 70 vol%, or at least 75 vol%, or at least 80 vol%, or at least 85 vol% open porosity for the total volume of porosity within the bond material. In another embodiment, the open porosity of the body may be not greater than 90 vol%, or not greater than 85 vol%, or not greater than 75 vol%, or not greater than 70 vol%, or not greater than 65 vol%, or not greater than 60 vol%, or not greater than 55 vol%, or not greater than 50 vol%, or not greater than 45 vol%, or not greater than 40 vol%, or not greater than 35 vol%, or not greater than 30 vol%, or not greater than 25 vol%, or not greater than 20 vol%, or not greater than 15 vol%, or not greater than 10 vol%, based on a total volume of the body. The open porosity can be a value between any of the minimum and maximum values noted above, such as within a range including at least 5 vol% to not greater than 90 vol%, or at least 10 vol% to not greater than 80 vol%, or at least 15 vol% to not greater than 45 vol%, or at least 20 vol% to not greater than 40 vol%, based on the total volume of the body.

In an embodiment, a ratio of total porosity to open porosity of the body may be not greater than 1:0.5, such as not greater than 1:0.55, or not greater than 1:0.6, or not greater than 1:0.65, or not greater than 1:0.7, or not greater than 1:0.75, or not greater than 1:0.8, or not greater than 1:0.85, or not greater than 1:0.9, or not greater than 1:0.99.

In a further embodiment, the coating can overly at least 50% of the exterior surface of the body including the pores contained within the body, or at least 60%, or at least 70% or at least 80%, or at least 90%, or at least 95% of the exterior surface of the body. In a particular embodiment, the coating can and may be directly bonded to essentially all of the exterior

CLAIMS

1. A bonded abrasive article comprising:

a body including:

a bond material;

abrasive particles contained within the bond material; and

pores contained within the body, wherein at least a portion of the pores have a coating comprising a polymer, wherein the polymer comprises a poly(p-xylylene) polymer including fluorine; and

wherein the body comprises a permeability of at least 100 mD.

2. The bonded abrasive article of claim 1, wherein the coating comprises parylene HT.

3. The bonded abrasive article of claims 1 or 2, wherein the body comprises a permeability of at least 800 mD and not greater than 15,000 mD.

4. The bonded abrasive articles of claims 1 or 2, wherein the body comprises an average pore size (D50) of at least 5 microns and not greater than 300 microns.

5. The bonded abrasive article of claims 1 or 2, wherein the pores comprise an open porosity defining an interconnected network of voids extending through the body, and wherein the open porosity is at least 5 vol% and not greater than 85 ~~90~~ vol% based on a total volume of the body.

6. The bonded abrasive article of claim 5, wherein a ratio of the total porosity to the open porosity of the body is not greater than 1:0.5.

7. The bonded abrasive article of claims 1 or 2, wherein the coating comprises an average thickness of at least 0.5 microns and not greater than 10 microns.

8. The bonded abrasive article of claim 1, wherein the coating has a melting point of at least 350°C and not greater than 600°C.

9. The bonded abrasive article of claims 1 or 2, wherein the abrasive particles comprises a material selected from oxides, carbides, nitrides, borides, oxynitrides, oxyborides, diamond, or any combination thereof.

10. The bonded abrasive article of claims 1 or 2, wherein the body comprises a flexural strength of at least 35 MPa.

11. The bonded abrasive article of claims 1 or 2, wherein a loss of flexural strength of the body after a corrosion treatment is not greater than 10%, the corrosion treatment being an exposure of the body for 24 hours in a water bath having a temperature of 99°C.

12. A method of forming a bonded abrasive body comprising:

providing a bonded abrasive having a body, the body comprising:

a bond material;

abrasive particles contained within the bond material;

pores contained within the body; and

coating at least a portion of the body with a coating comprising a poly(p-xylylene) polymer including fluorine by conducting a vapor deposition process,

wherein the permeability of the body after coating is at least 100 mD.

13. The method of claim 12, wherein the coating comprises parylene HT.

14. The method of claim 12, wherein an increase of a flexural strength of the body after coating is at least 5% in comparison to a flexural strength of the body before coating.