In another embodiment, the abrasive article of the present disclosure can be a complex shaped tool based on a substrate having a complex shape. As used herein, a complex shaped substrate can have surfaces with a non-monotonic curvature, more specifically a combination of different curvatures, such as a combination of convex and concave curvatures. The substrate (sometimes also called backing herein) can be an organic material, an inorganic material, or a combination thereof. Particularly suitable organic substrate materials can include polymers, such as polyester, polyurethane, polypropylene, and/or polyimide, for example KAPTON from DuPont, and paper. Some suitable inorganic materials can include metals, metal alloys, and particularly, foils of copper, aluminum, steel, or any combination thereof. In certain instances, the substrate can include a woven material or a non-woven material. The substrate can include one or more additives selected from the group of catalysts, coupling agents, curants, anti-static agents, suspending agents, anti-loading agents, lubricants, wetting agents, dyes, fillers, viscosity modifiers, dispersants, defoamers, and grinding agents. Such substrate materials may be suitable for use in coated abrasive articles.

The coating of the abrasive article of the present disclosure can at least partially overly the exterior surface of the bond material and thereby may strengthen and protecting the bond material and its ability to hold the abrasive particles.

In one embodiment, as illustrated in **FIG. 1**, the coating (105) can be in direct contact with the bond material and may further overly a majority of the exterior surfaces of the abrasive particles (103) extending above the bond material (102).

In another embodiment, the coating (205) can be in direct contact with the bond material (202) overlying the substrate (201), and a majority of the exterior surfaces of the abrasive particles (203) extending above the bond material (202) are free of the coating (205), as illustrated in **FIG. 2**.

In a further embodiment, the coating (305) can be in direct contact with the abrasive particles (303) and a majority of an exterior surface of the bond material (302) overlying the substrate (301) may be free of the coating (305), see **FIG. 3**.

In yet another embodiment, the substrate (401) of an abrasive article (400) can be non-woven fibers twisted on each other containing abrasive particles (403) coupled to the fibers by a bond material (402), wherein the bond material (402) and the extending abrasive particles (403) are at least partially coated by the coating (405) of the present disclosure, as illustrated in **FIG. 4**.

In a further particular embodiment, the coating can be a conformal coating extending over the abrasive particles and the bond material. In a certain aspect, the coating can define

CLAIMS

1. An abrasive article comprising:

a substrate;

abrasive particles coupled to the substrate by a bond material; and

a coating overlying at least a portion of the least one bond material, wherein the coating comprises a fluorinated poly(p-xylylene) polymer.

2. The abrasive article of claim 1, wherein the abrasive particles are arranged in a single layer overlying the substrate.

3. The abrasive article of claim 1, wherein the abrasive particles have an average particle size (D50) greater than an average thickness of the bond material.

4. The abrasive article of claims 1, 2, or 3, wherein the bond material comprises a plurality of layers, including a first layer and a second layer overlying the first layer.

5. The abrasive article of claims 1, 2, or 3, wherein the substrate comprises a material selected from the group consisting of a metal, metal alloy, polymer, woven material, non-woven material, a fibrous material, paper, or any combination thereof.

6. The abrasive article of claims 1, 2, or 3, wherein the bond material comprises a material selected from an organic material, an inorganic material, or a combination thereof.

7. The abrasive article of claim 6, wherein the bond material comprises a material including a metal, a metal alloy, a ceramic, a cermet, a glass, a composite, or any combination thereof.

8. The abrasive article of claim 6, wherein the bond material comprises a material including a polyester, an epoxy resin, a polyurethane, a polyamide, a polyacrylate, a polymethacrylate, a polyvinyl chloride, a polyethylene, a polysiloxane, a silicone, a cellulose acetate, a nitrocellulose, a natural rubber, starch, or any combination thereof.

9. The abrasive article of claims 1, 2, or 3, wherein the coating comprises parylene HT.

10. The abrasive article of claim 9, wherein the coating consists essentially of parylene HT.

11. The abrasive article of claims 1, 2, or 3, wherein the coating comprises an average thickness of at least 0.5 microns and not greater than 25 microns.

12. The abrasive article of claims 1, 2, or 3, wherein the abrasive particles comprise a material selected from the group of oxides, carbides, nitrides, borides, oxynitrides, oxyborides, diamond, or any combination thereof.

13. The abrasive article of claims 1, 2, or 3, wherein the substrate comprises a first surface, a second surface, and a side surface extending between the first surface and second surface, and wherein the first surface is a planar surface and the abrasive particles are coupled to the first surface by the bond material.

14. A method of forming an abrasive article, comprising:

providing a substrate having abrasive particles coupled to a surface of the substrate by a bond material;

applying a coating by vapor deposition, wherein the coating overlies the bond material and abrasive particles, wherein the coating comprises a fluorinated poly(p-xylylene) polymer.

15. The method of claim 14, wherein the fluorinated poly(p-xylylene) polymer includes parylene HT.