Summary

[0006] The present disclosure relates to an abrasive article including a first abrasive element, a second abrasive element, a resilient element having first and second major surfaces, and a carrier. The first element and the second abrasive element each comprises a first major surface and a second major surface. At least the first major surfaces of the first and second abrasive elements comprise a plurality of precisely shaped features. The abrasive elements comprise substantially inorganic, monolithic structures.

[0006a] In one aspect, the present disclosure relates to an abrasive article comprising: a first abrasive element; a second abrasive element; a resilient element having first and second major surfaces; and a carrier; wherein the first and second abrasive elements each comprises a first major surface and a second major surface; wherein at least the first major surfaces of the first and second abrasive elements comprise a plurality of precisely shaped features; and wherein the abrasive elements comprise ~~substantially~~ inorganic, monolithic structures.

[0007] The present disclosure also relates to a method of making an abrasive article. The method includes first providing a first abrasive element and a second abrasive element, wherein each of the first and second abrasive elements comprises a first major surface and a second major surface, where at least the first major surfaces include a plurality of precisely shaped features. The method further includes placing the first major surface of the first and second abrasive elements in contact with an alignment plate, providing a resilient element having first and second major surfaces, affixing the first major surface of the resilient element to the second major surfaces of the abrasive elements, providing a fastening element and affixing the second major surface of the resilient element to a carrier through the fastening element. A collective group of features on all the abrasive elements, having a common maximum design feature height of D_o, have a non-coplanarity of less than about 20% of the feature height.

[0007a] In another aspect, the present disclosure relates to a method of making an abrasive article comprising: providing a first abrasive element and a second abrasive element, wherein each of the first and second abrasive elements comprises a first major surface and a second major surface, where at least the first major surfaces comprise a plurality of precisely shaped features; placing the first major surface of the first and second abrasive elements in contact with an alignment plate; providing a resilient element having first and second major surfaces; affixing the first major surface of the resilient element to the second major surfaces of the abrasive elements; providing a fastening element; and affixing the second major surface of the resilient element to a carrier through the fastening element; wherein a collective group of features on all the abrasive elements, having a common maximum design feature height of D_o, have a non-coplanarity of less than about 20% of the feature height.

[0008] The present disclosure also relates to an abrasive article including a first abrasive element, a second abrasive element, a resilient element having first and second major surfaces, and a carrier. The first and second abrasive elements each includes a first major surface and a second major surface. At least the first major surfaces of the first and second abrasive elements include a plurality of precisely shaped features having a diamond coating. The abrasive elements include substantially inorganic, monolithic structures.

[0008a] In another aspect, the present disclosure relates to an abrasive article comprising: a first abrasive element; a second abrasive element; a resilient element having first and second major surfaces; and a carrier; wherein the first and second abrasive elements each comprises a first major surface and a second major surface; wherein at least the first major surfaces of the first and second abrasive elements comprise a plurality of precisely shaped features having a diamond coating; and wherein the abrasive elements comprise ~~substantially~~ inorganic, monolithic structures.

Brief Description of Drawings

[0009] FIG. 1a is a top view of a positive master having pyramid precisely shaped features arranged in a grid pattern used in some of the Examples.

[0010] FIG. 1b is a cross-sectional view of the positive master of FIG. 1a having pyramid precisely shaped features arranged in a grid pattern.

[0011] FIG. 2 is a top view of an abrasive article including abrasive elements of the present invention arranged in a star pattern.

[0012] FIGS. 3a and 3b show the global coplanarity of Example 12 and Comparative Example 13.

[0013] FIG. 4a is a top view of a positive master having pyramid precisely shaped features arranged in a grid pattern used in Example 15.

[0014] FIG. 4b is a cross-sectional view of the positive master of FIG. 4a having pyramid precisely shaped features arranged in a grid pattern.

What is claimed is:

1. An abrasive article comprising:

a first abrasive element;

a second abrasive element;

a resilient element having first and second major surfaces; and

a carrier;

wherein the first and second abrasive elements each comprises a first major surface and a second major surface;

wherein at least the first major surfaces of the first and second abrasive elements comprise a plurality of precisely shaped features; and

wherein the abrasive elements comprise ~~substantially~~ inorganic, monolithic structures.

2. The abrasive article of claim 1, further comprising a fastening element.

3. The abrasive article of claim 1, wherein the resilient element is selected from the group consisting of: a mechanical spring-like device, a foam, a gel, a polymer, a spring and a flexible washer.

4. The abrasive article of claim 1, wherein the first and second elements are fastened to the carrier such that a collective group of precisely shaped features on all the abrasive elements, having a common maximum design feature height of D_o, have a non-coplanarity of less than about 20% of the feature height.

5. The abrasive article of claim 1, wherein the inorganic, monolithic structures are 99% carbide ceramic by weight.

6. The abrasive article of claim 1, wherein the inorganic, monolithic structures are ~~substantially~~ free of oxide sintering aides.

7. The abrasive article of claim 1, wherein each of the first and second elements with precisely shaped features has a feature non-uniformity of less than about 20% of the feature height.

8. The abrasive article of claim 1, wherein the first and second abrasive elements are arranged in a star or double star pattern.

9. The abrasive article of claim 1, wherein the article is a double sided pad conditioner.

10. A method of making an abrasive article comprising:

providing a first abrasive element and a second abrasive element, wherein each of the first and second abrasive elements comprises a first major surface and a second major surface, where at least the first major surfaces comprise a plurality of precisely shaped features;

placing the first major surface of the first and second abrasive elements in contact with an alignment plate;

providing a resilient element having first and second major surfaces;

affixing the first major surface of the resilient element to the second major surfaces of the abrasive elements;

providing a fastening element; and

affixing the second major surface of the resilient element to a carrier through the fastening element;

wherein a collective group of features on all the abrasive elements, having a common maximum design feature height of D_o, have a non-coplanarity of less than about 20% of the feature height.

11. An abrasive article comprising:

a first abrasive element;

a second abrasive element;

a resilient element having first and second major surfaces; and

a carrier;

wherein the first and second abrasive elements each comprises a first major surface and a second major surface;

wherein at least the first major surfaces of the first and second abrasive elements comprise a plurality of precisely shaped features having a diamond coating; and

wherein the abrasive elements comprise ~~substantially~~ inorganic, monolithic structures.

12. The abrasive article of claim 11, wherein the diamond coating is selected from one of diamond, doped diamond, diamond like carbon, diamond like glass, polycrystalline diamond, microcrystalline diamond, nanocrystalline diamond and combinations thereof.

13. The abrasive article of claim 11, wherein the diamond coating is applied by a chemical vapor deposition process or a physical vapor deposition process.