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(54) **RETAINING RING OF A WAFER CARRIER**

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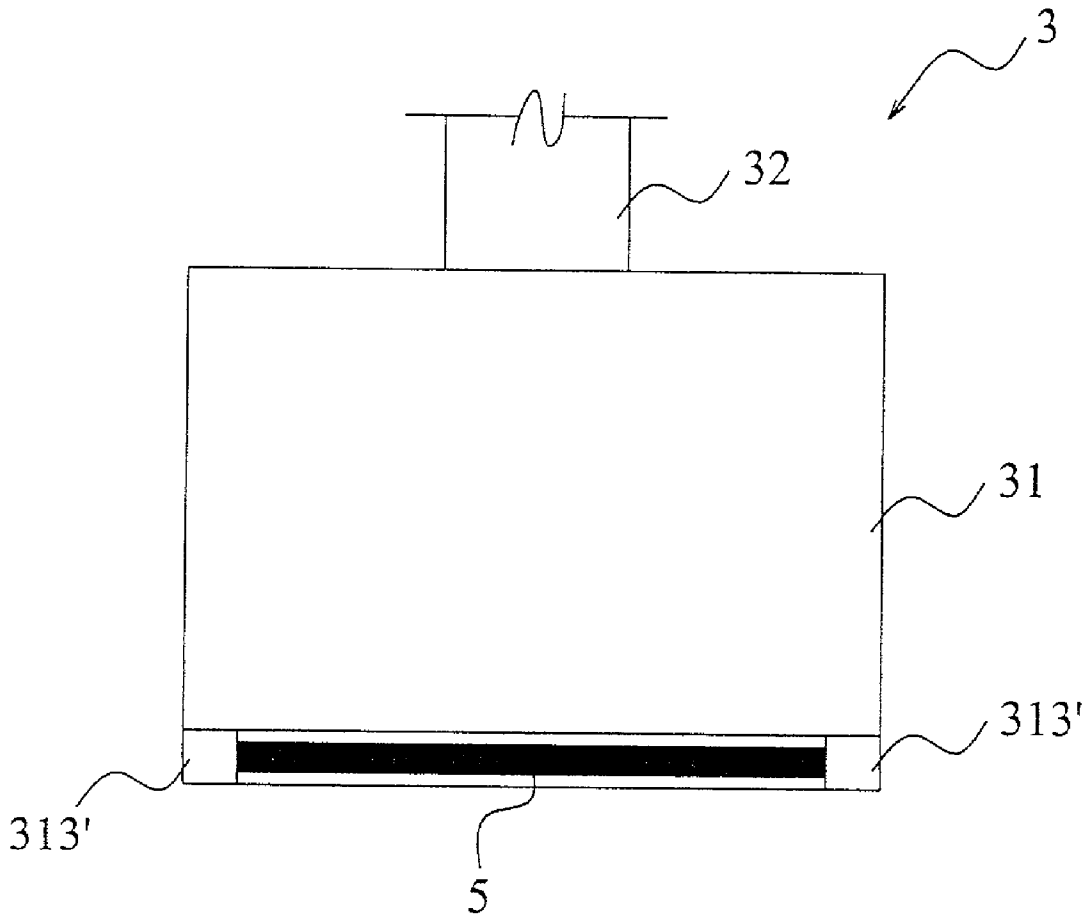
(57) **ABSTRACT**

A retaining ring of a wafer carrier includes a polymer containing abrasives. The abrasives can be released from the polymer by the friction between the polymer and the polishing pad. Therefore, it is convenient to maintain the wafer and is possible to prevent abrasives from aggregating in the polishing slurry. Meanwhile, the time for replacing the polishing slurry can be reduced and the polishing operation as a whole can be simplified so as to reduce the cost and promote productive efficiency.



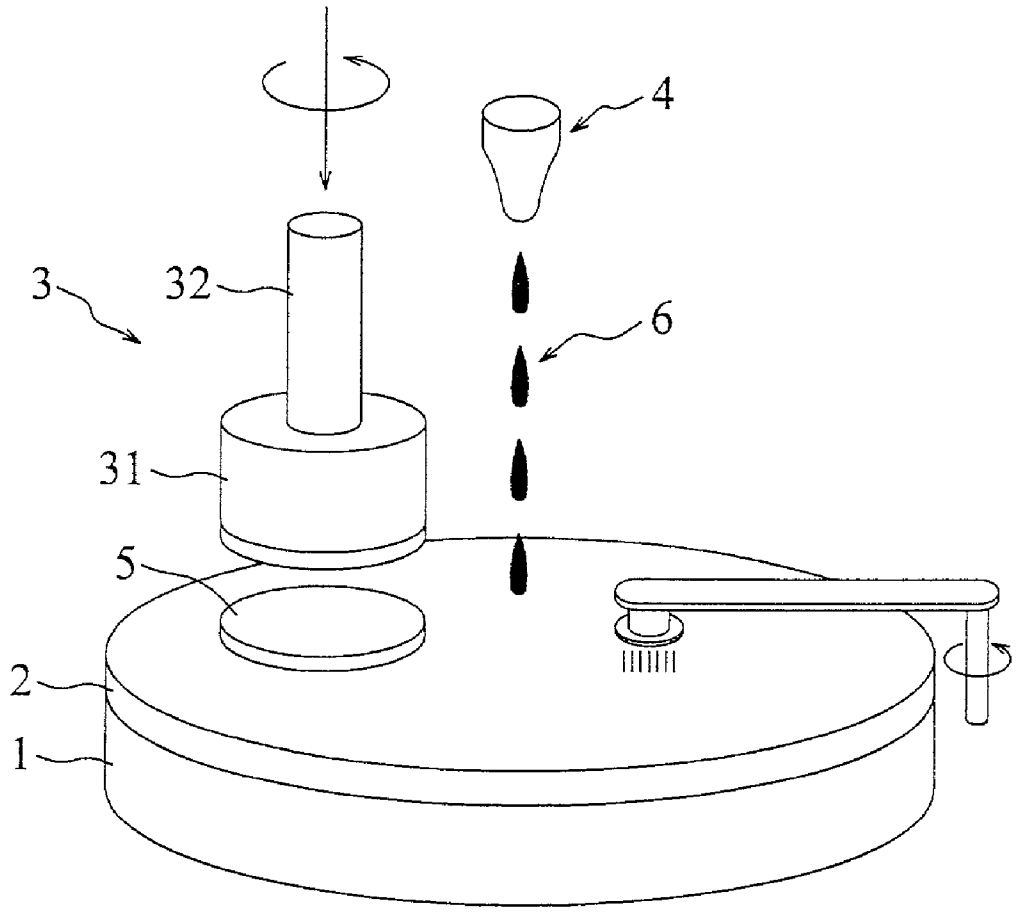


FIG. 1
(PRIOR ART)

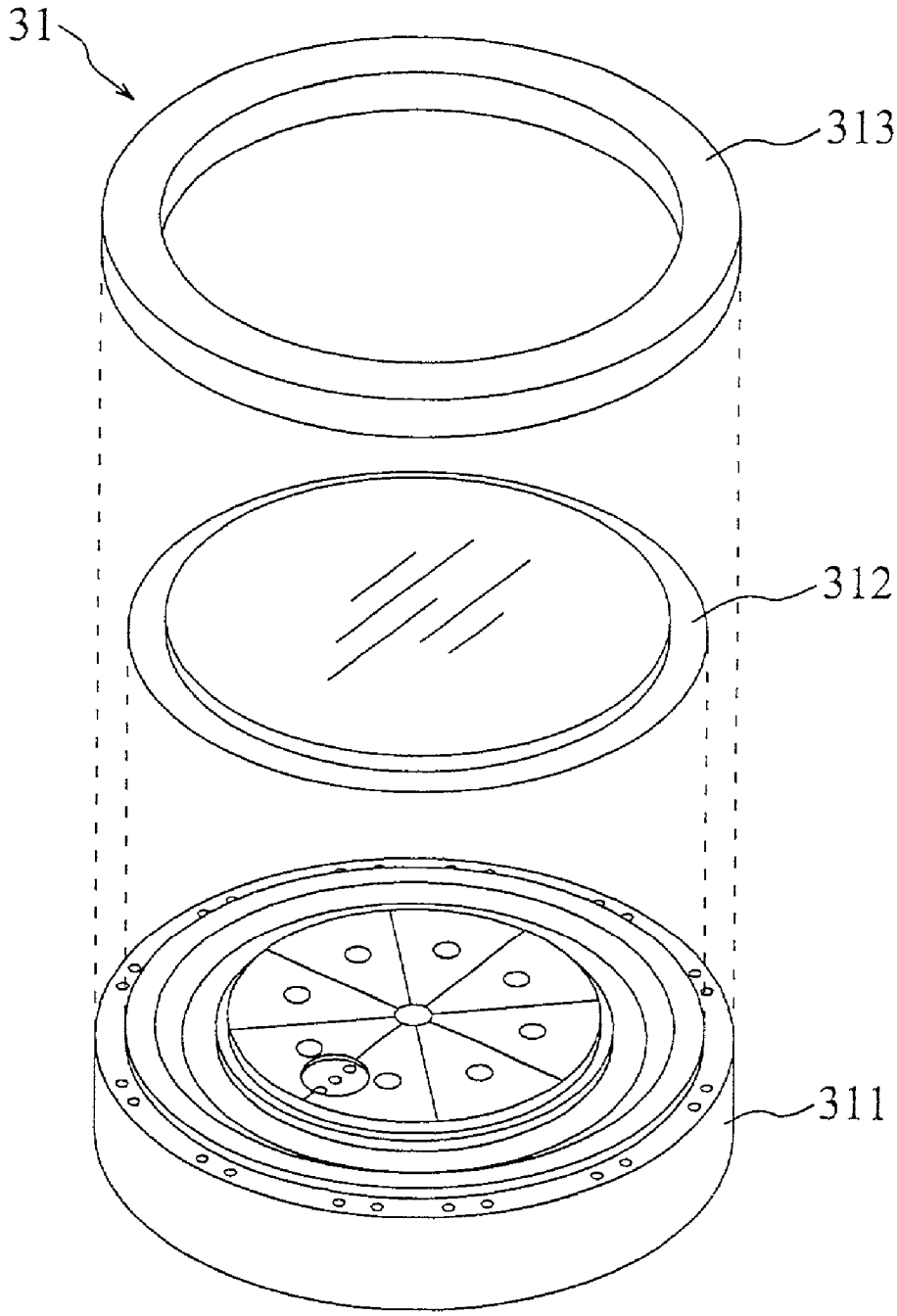


FIG. 2
(PRIOR ART)

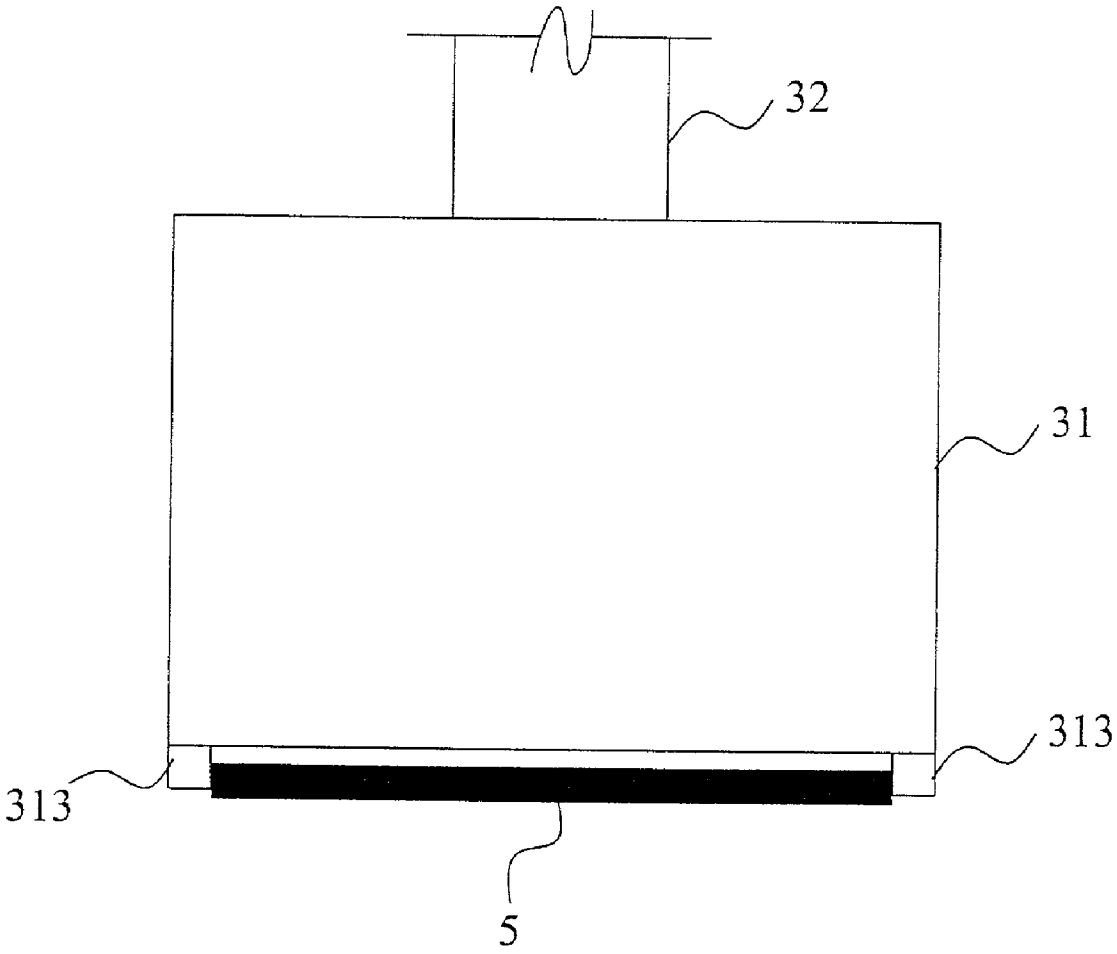


FIG. 3
(PRIOR ART)

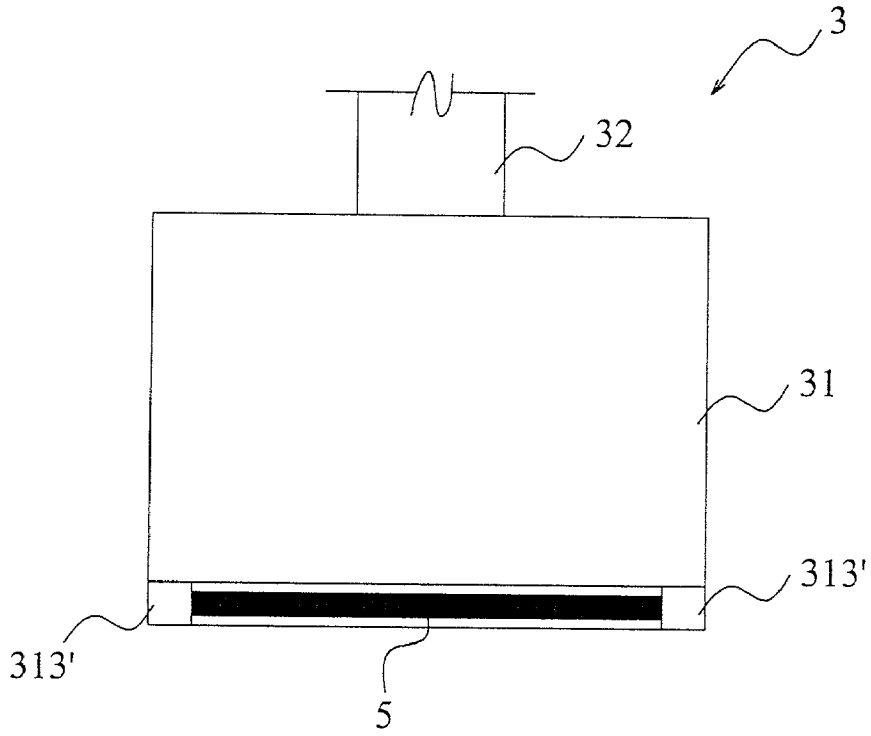


FIG. 4A

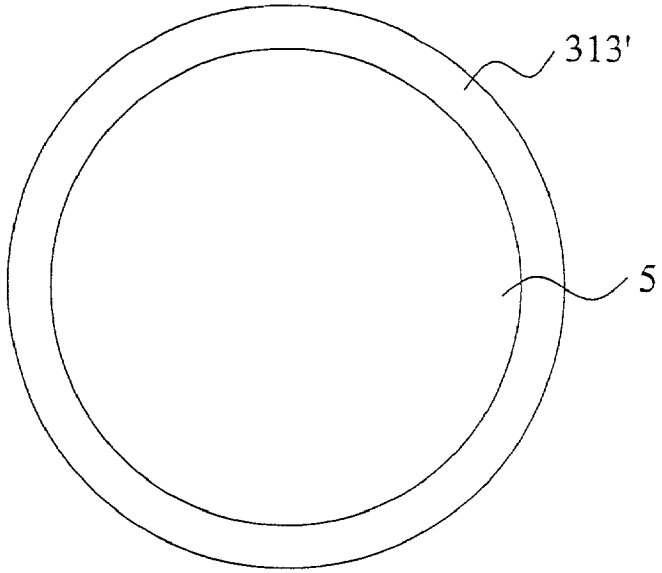


FIG. 4B

RETAINING RING OF A WAFER CARRIER

BACKGROUND OF THE INVENTION

[0001] A. Field of the Invention

[0002] The invention relates to a retaining ring of a wafer carrier, and especially to a retaining ring of a wafer carrier applicable to a chemical-mechanical polishing (CMP) apparatus.

[0003] B. Description of the Related Art

[0004] With reference to **FIG. 1, a** conventional CMP apparatus essentially includes a polishing platen **1** for performing the wafer polishing, a polishing pad **2** mounted on the polishing platen **1**, a wafer carrier **3** for maintaining a wafer **5** to be polished and a polishing slurry supply mechanism **4** for supplying polishing slurry **6**.

[0005] The wafer carrier **3** essentially includes a polish head **31** and a spindle **32**. As shown in **FIG. 2**, the polish head **31** includes a polish head body **311**, a membrane **312** and a retaining ring **313**.

[0006] As shown in **FIG. 3**, most of the conventional retaining rings **313** are made of Teflon. Because the retaining ring **313** made of Teflon will have a relatively higher hardness, it is necessary to slightly extend the surface of the wafer **5** out of the retaining ring **313** to prevent the retaining ring **313** from damaging the polishing pad **2** when used. It is very inconvenient to retain the wafer **5**, since the wafer **5** surface has to be slightly exposed from the retaining ring **313** when used. Especially, the retaining ring **313** will be somewhat deformed after being used a period of time and it is more difficult to retain a wafer **5** in a deformed retaining ring **313**.

[0007] In order to resolve the above-mentioned problem, a retaining ring **313** made of polyphenylene-sulfide (hereinafter also referred to PPS) has recently been developed by manufacturers. A retaining ring **313** made of PPS has a relatively lower hardness. It is not necessary to particularly take care of the relative position between the wafer **5** and the retaining ring **313** when a retaining ring **313** made of PPS is used, since the part of the retaining ring **313** which extends out of the surface of the wafer **5** will be abraded by friction. Therefore, it is more convenient to employ the PPS retaining ring **313** to maintain the wafer **5**.

[0008] Though the PPS retaining ring **313** is convenient in maintaining the wafer **5**, however, it does not simplify the total polishing operation. Therefore, to maintain the convenience of retaining the wafer while simplifying the total polishing operation is another important problem needed to be resolved. Here, the polishing operation also includes a retaining ring replacing procedure and a polishing slurry replacing procedure.

[0009] Though the ingredients of the polishing slurry **6** can be varied depending on the ingredients of the wafer surface, its essential ingredients include abrasives, de-ionized (DI) water, a chemical solvent or an oxidizing agent. All the conventional polishing slurries **6** include abrasives and the abrasives inclined to aggregate into larger abrasives when the polishing slurry flows in the pipe (not shown) of the polishing slurry supply mechanism after a long period of time. The larger abrasives will scratch the wafer **6** during polishing. Therefore, to prevent the wafer from being scratched by the aggregated abrasives is another important problem to be resolved.

SUMMARY OF THE INVENTION

[0010] In view of the above, an objective of the invention is to provide a retaining ring for a wafer carrier, which can conveniently retain a wafer and prevent abrasive aggregation in the polishing slurry.

[0011] Another objective of the invention is to provide a retaining ring of a wafer carrier, which can reduce the time in replacing the polishing slurry and simplify the polishing operation as a whole so as to reduce the cost and to promote productive efficiency.

[0012] To achieve the above-mentioned objectives, the invention provides a retaining ring for a wafer carrier wherein the retaining ring includes a polymer containing abrasives.

[0013] With the retaining ring according to the invention, the abrasives contained in the retaining ring will be released by the friction between the retaining ring and the polishing pad. Therefore, it is not necessary to add any abrasive in the polishing slurry and there is no problem of abrasive aggregation in the pipe of the polishing slurry supply mechanism.

[0014] In addition, unlike prior art, it is possible to directly replace the retaining ring without replacing the polishing slurry or cleaning the pipe of the polishing slurry supply mechanism if one simply wants to replace the abrasives. Even though it is necessary to replace the polishing slurry and to clean the pipe of the polishing slurry supply mechanism, the time needed for replacing or cleaning will be shorter, since no abrasive aggregation occurs in the polishing slurry supply mechanism. Therefore, the time for replacing the polishing slurry is greatly reduced and the polishing operation as a whole can be simplified so as to reduce the cost and promote productive efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] These and other objectives and advantages of the invention will become apparent by reference to the following description and accompanying drawings wherein:

[0016] **FIG. 1** is a schematic view showing a part of a conventional CMP apparatus;

[0017] **FIG. 2** is an exploded view showing the essential part of a wafer carrier of a conventional CMP apparatus;

[0018] **FIG. 3** is a partial sectional view showing a conventional wafer carrier;

[0019] **FIG. 4A** is a sectional view showing a wafer carrier according to one embodiment of the invention; and

[0020] **FIG. 4B** is a bottom view of the wafer carrier shown in **FIG. 4A**.

DETAIL DESCRIPTION OF THE INVENTION

[0021] In the following, a preferred embodiment according to the invention will be described in detail with reference to **FIGS. 4A and 4B**. Before describing it, it is intended to point out that the same referential numerals shown in **FIGS.**

1, 2 and **3** are also adopted herein to indicate the similar elements for the sake of convenience in describing similar elements.

[**0022**] With reference to **FIGS. 4A and 4B**, the retaining ring **313'** of a wafer carrier **3** in accordance with the invention is applied to maintain a wafer **5** on a wafer carrier **3**. The retaining ring **313'** is formed of a polymer containing abrasives therein. In this embodiment, suitable abrasives for forming the retaining ring **313'** include SiO_2, Al_2O_3 and CeO_2.

[**0023**] With the retaining ring **313'** according to the invention, the abrasives contained in the retaining ring **313'** will be released by the friction between the retaining ring **313'** and the polishing pad **2**. Therefore, it is not necessary to add any abrasive in the polishing slurry and there is no problem of abrasive aggregation in the pipe of the polishing slurry supply mechanism **4**.

[**0024**] In addition, unlike prior art, it is possible to directly replace the retaining ring **313'** without replacing the polishing slurry or cleaning the pipe of the polishing slurry supply mechanism **4**, if one simply wants to replace the abrasives. Even though it is necessary to replace the polishing slurry and to clean the pipe of the polishing slurry supply mechanism **4**, the time needed for replacing or cleaning will be shorter, since no abrasive aggregation occurs in the polishing slurry supply mechanism **4**. Therefore, the time for replacing the polishing slurry is greatly reduced and the polishing operation as a whole can be simplified so as to reduce the cost and promote productive efficiency.

[**0025**] While this invention has been described with reference to an illustrative embodiment, this description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiment, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to the description. It is therefore intended that the appended claims encompass any such modifications or embodiments.

What is claimed is:

1. A retaining ring of a wafer carrier applicable to maintain a wafer on a wafer carrier, said retaining ring including a polymer and characterized by said polymer containing abrasives therein.

2. The retaining ring of a wafer carrier as claimed in claim 1, wherein the abrasive is SiO_2.

3. The retaining ring of a wafer carrier as claimed in claim 1, wherein the abrasive is Al_2O_3.

4. The retaining ring of a wafer carrier as claimed in claim 1, wherein the abrasive is CeO_2.

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