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KYODO INTERNATIONAL INC.

Example of longevity improvement of retaining ring which is a common CMP system issue

【Contact】

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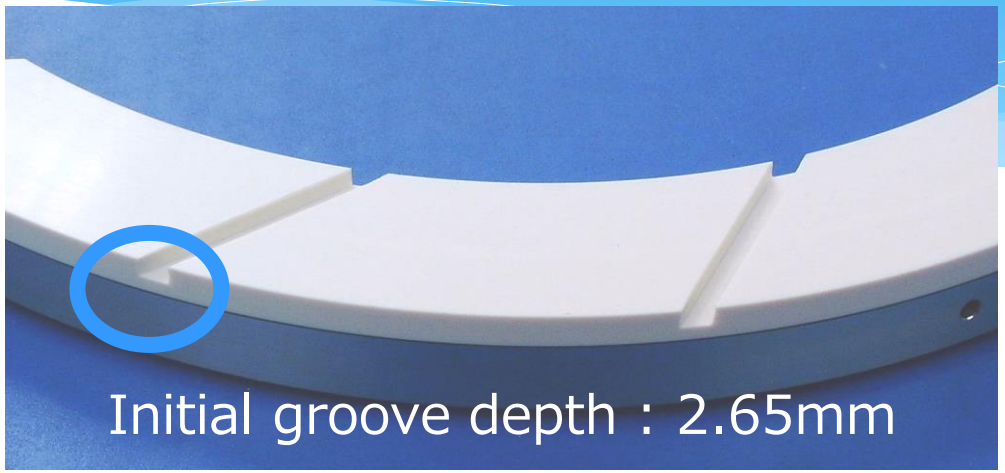
Extension of x6-7 lifetime is achievable by changing material for retaining ring



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Comparison of remaining groove depth after 15 hours continuous CMP between PPS and new material for retaining ring

<PPS>　Approximately 2.25mm（wear level 0.4mm）

<New material>　Approximately 2.55mm（wear level 0.1mm）

* Polished at 200mm CMP equipment for TEOS-CMP process

This data shows that the new material has x4 durability against for PPS.
After 3 mounts consecutive running of equipment, the new material accomplishes x6-7 lifetime.

It resulted total running cost reduction up to 1/3 to 1/4

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Cost reduction (example)

in case of 2 piece retaining ring for 200mm Oxide-CMP

PPS ring

@25,000 ×100 pcs / a month ＝ ¥2,500,000/a month

New material ring

@50,000 × 30pcs / a month ＝ ¥1,500,000/a month

Yield improvement can also be expected.

“X3G”, a newly developed polymer material for CMP retaining ring

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	Ketron PEEK	Techtron PPS	ETX	X3G	Vespel	SCP-5000	CTR
Aluminum	0.30	0.13	53.00	3.30	0.05	0.078	0.15
Barium	0.05	0.00	140.00	0.18	0.001	0.0038	0.12
Calcium	7.90	0.14	5.00	2.20	0.629	0.79	0.1
Chromium	0.48	0.03	0.07	0.50	0.128	0.039	0.56
Copper	0.17	0.06	0.85	0.04	0.012	0.536	0.15
Iron	5.60	0.25	8.20	8.50	0.524	0.774	6.5
Lead	0.04	<.005	0.00	0.01	0.0001	0.019	0
Lithium	<.005	<.005	0.00	0.00	0.003	0.002	0
Magnesium	0.95	0.08	150.00	110.00	0.112	0.492	1.1
Nickel	0.33	0.03	0.24	0.57	0.026	0.18	0.22
Potassium	1.50	0.30	12.00	0.24	0.011	0.076	2.3
Sodium	21.00	460	2.20	0.95	0.41	2.72	18
Strontium	0.55	<.002	2.00	0.01	0.0018	0.0063	0.55
Titanium	0.12	0.40	3,200.00	0.52	0.0062	0.019	0.32
Zinc	0.11	<.002	5.20	0.04	0.101	0.674	0.29

SPM TECHNOLOGY

X3G is developed at SPM Technology (US)

Features of X3G

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①Longer lifetime

- ✓ x3–5 longevity against PPS

*PPS : The most popular polymer material for CMP application

- ✓ Typical problem of conventional alternative polymer = Side-attack

Side-attack : dent occurred at the sidewall of ring I.D due to continuous wafer contacts

- ✓ X3G achieves longer life performance by solving the issue of side-attack.

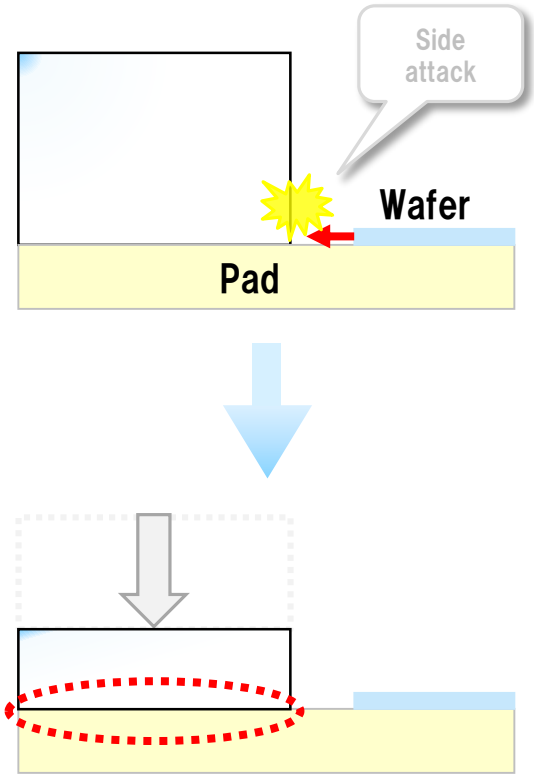
②Improvement of uniformity

- ✓ Accomplishment of flatter uniformity
- ✓ As a result, it contributes to improve production yield by increasing number of qualified chips at the outer edge of wafer.

Advantage of X3G for side-attack failure

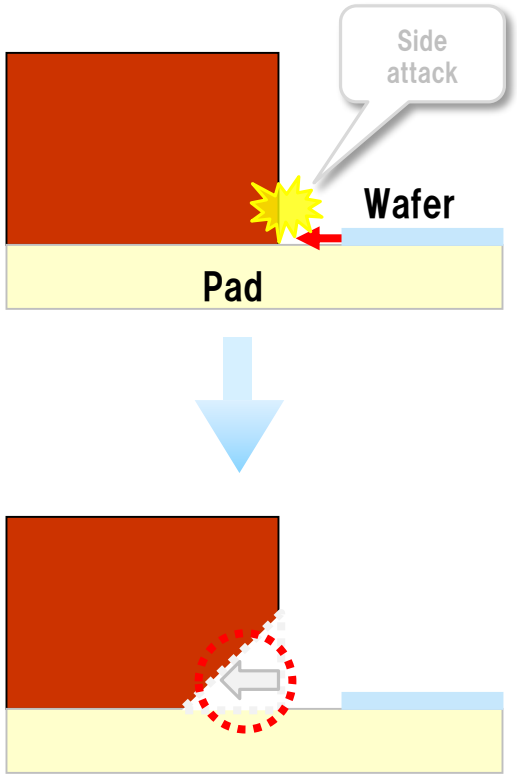
PPS

Side-attack wears out the ring. It is possible to get polished, but eventually it gets worn out



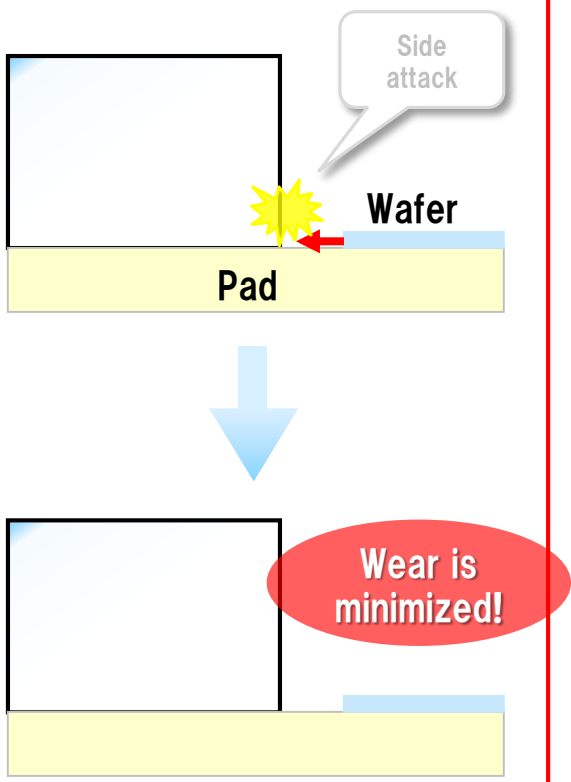
Conventional long life resin

The ring cannot be worn out. However, the scratch caused by the side-attack stays and results in bad influence over the CMP profile.



X3G

Reduce the wearing out of the ring, and more : realizes a stable and long-life CMP!



The mechanism why X3G can reduce side-attack failure

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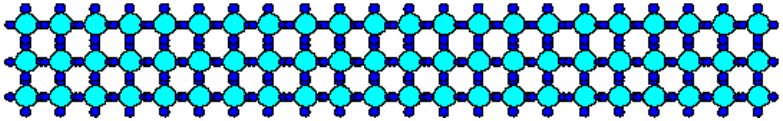
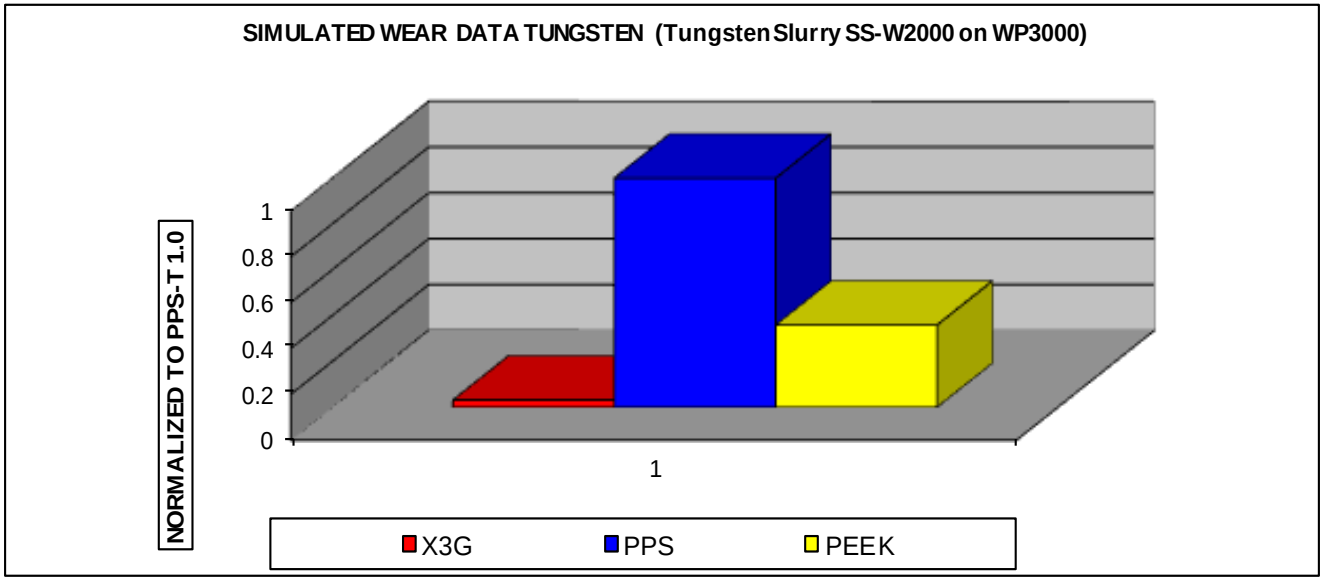
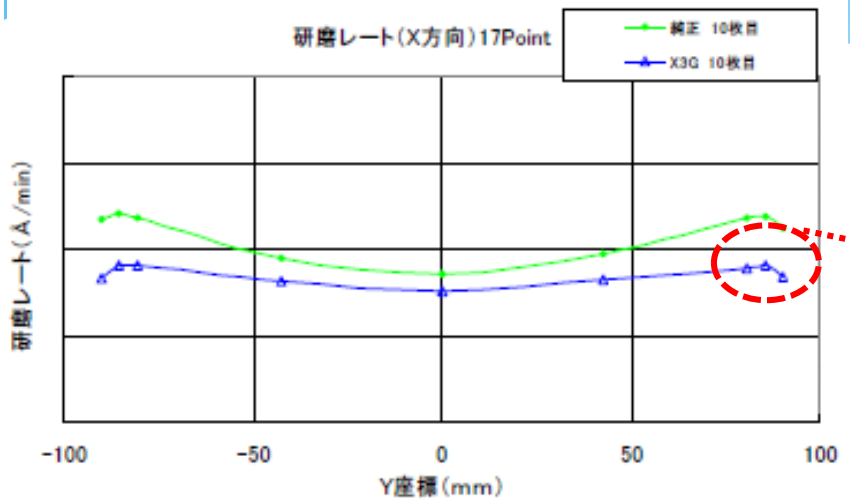
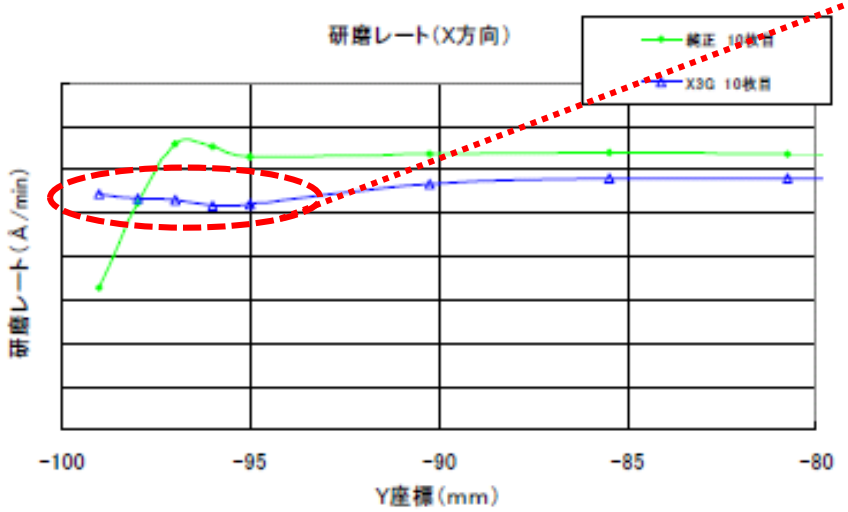


We developed more robust polymer structure by implementing SPM Technology's proprietary unique processes – – in order to achieve lower coefficient of friction.



Improvement of uniformity





Hence distribution of outer edge of wafer changes, "defocus in photolithography after CMP" is improved.,
As a result, yield of chip production improves dramatically.
(Improved 1% at whole wafer and 20% at outer edge area)

Data : 200mm CMP equipment (for TEOS CMP)

This customer had already applies X3G rings to 70% of retaining rings for oxide-CMP.