

March 9, 2021

DURAZR[®]-S series

「HSY-0480」

Product Information

Note:

- The contents of this document and the listed products herein are confidential.
- Disclosure of any confidential information to anyone other than the intended recipient is prohibited.
- Daiichi Kigenso Kagaku Kogyo Co., Ltd. holds the intellectual property rights on the contents of this document and the listed products herein.
- The powders we provide are for general industrial materials and are not intended for military applications, nuclear power, medical treatment, surgical implants, foods, cosmetics or their additives.
- The technical data contained in this document represents the current state of our product knowledge and is for information purposes only. It does not constitute a guarantee or specification. In addition, the contents are subject to change without notice due to changes in specifications and so on.
- Revision of the second edition: April 17, 2023

DURAZR[®]-S series

HSY-0480

CONFIDENTIAL

What is DURAZR[®]-S?

- Using our ATEDZ technology, we have developed a zirconia powder that can achieve a ceramic material with high strength and toughness when sintered at low temperature.

Conventional zirconia grade
Sintered at 1400~1450°C

ATEDZ

DURAZR[®]-S series
Improved strength and toughness

Sintered at 1200~1300°C

ATEDZ (Advanced Toughness and Easy-sintering DKK Zirconia technology)

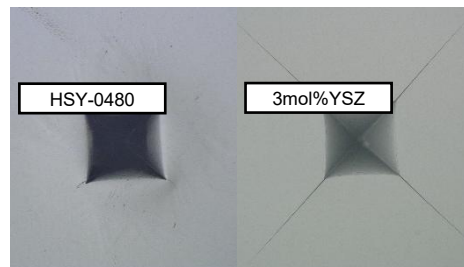
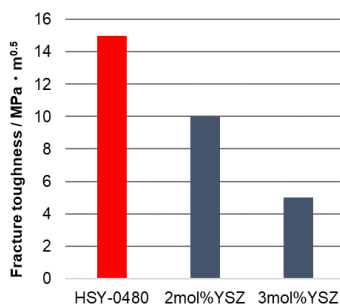
Technology to improve sinterability by controlling the aggregation state of zirconia particles.

Characteristics of HSY-0480

High Strength and High Toughness

HSY-0480 is a zirconia powder that uses calcium as a stabilizer. It can produce high-strength, high-toughness sintered bodies that cannot be obtained at conventional sintering temperatures.

● Fracture toughness of HSY-0480

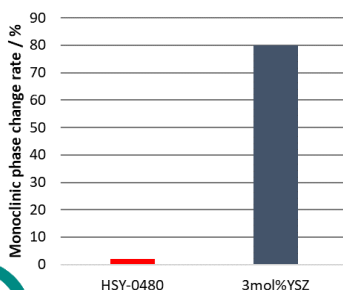


Vickers indentation shape of sintered body

High Degradation Resistance

HSY-0480 has high hydrothermal degradation and thermal degradation resistance.

● Hydrothermal degradation resistance of HSY-0480 (134°C × 75hr)



Reduction of Raw Material Risk

HSY-0480 uses calcium as a stabilizer and reduces raw material risk through domestic procurement.

- Calcium is 1000 times more abundant in the earth's crust than yttrium (a typical stabilizing element) *1.
- Widely distributed throughout the world.
- Calcium is the only mineral resource that is abundant in Japan.
- More than 90% of yttrium oxide is imported from specific countries*2.

* 1. The Chemical Society of Japan, Chemistry Handbook Basic Edition, (Maruzen, 1966).

* 2. "Trade Statistics of Japan, Table of Countries by Commodity," Ministry of Finance.

<https://www.customs.go.jp/toukei/srch/index.htm?M=01&P=1,2,.....,4,1,2022,0,0,0,2,284690210,.....,1,.....,20>



DAIICHI KIGENSO KAGAKU KOGYO CO., LTD.

<https://www.dkkk.co.jp/english/products/index.html>

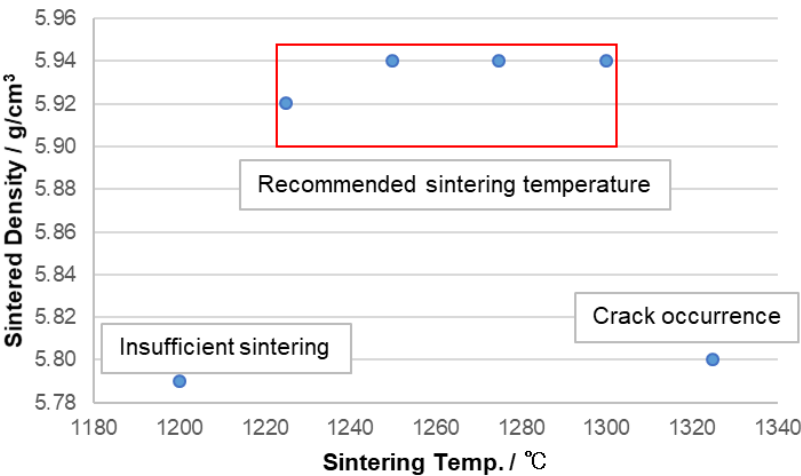
Sales department
+81-6-6231-3835

Characteristic Data ①

CONFIDENTIAL

■ Characteristics of Sintered Body

		HSY-0480					
Sintering Temp.	°C	1200	1225	1250	1275	1300	1325
Sintered Density	g/cm³	5.79	5.92	5.94	5.94	5.94	Crack
3-point bending strength	MPa	900	1000	1000	900	800	Crack
Fracture toughness	MPa·m ^{0.5}	<10	10~15	≥15	≥15	≥15	Crack



● Sintering behavior of HSY-0480

■ Degradation Resistance of HSY-0480

			HSY-0480	3mol%YSZ
Sintering Temp.	-	°C	1250	1450
Monoclinic phase change rate	Hydrothermal treatment 134°C × 75hr	%	1	79
	Heat treatment 300°C × 50hr	%	2	1

● Characteristics

- It shows high mechanical properties in low-temperature sintering at 1225-1300°C.
- It shows high stability against hydrothermal degradation and thermal degradation.



DAIICHI KIGENSO KAGAKU KOGYO CO., LTD.
<https://www.dkkk.co.jp/english/products/index.html>

Sales department
+81-6-6231-3835

Characteristic data ②

Characteristics of Powder and Sintered Body

CONFIDENTIAL

	Item	Unit	Analysis Result
Characteristics of Powder	ZrO ₂ +HfO ₂	wt%	97.93
	CaO	wt%	2.07
	Al ₂ O ₃	wt%	0.25
	Fe ₂ O ₃	wt%	0.001
	TiO ₂	wt%	0.001
	SiO ₂	wt%	0.006
	Na ₂ O	wt%	0.011
	H ₂ O	wt%	0.55
	L.O.I (H ₂ O Containing)	wt%	5.49
	Bulk Density	g/cm ³	1.07
	Green Density	g/cm ³	2.98
Particle Size Distribution	180μm on	wt%	0
	180-106μm	wt%	0.5
	106-90μm	wt%	2.6
	90-75μm	wt%	6.4
	75-63μm	wt%	15.4
	63-45μm	wt%	35.5
	45-38μm	wt%	16.3
	38μm pass	wt%	23.3
Characteristics of Sintered Body (Sintering temp.:1250°C)	Sintered Density	g/cm ³	5.94
	3-point bending strength	MPa	1000
	Vickers hardness	HV	1100
	Fracture toughness (IF method:294N)	MPa·m ^{0.5}	≥15

※Molding / sintering method

- Molding Method : After uniaxial press molding (9.8MPa), 196MPa, Cold Isostatic Pressing (CIP) molding.
- Sintered at 1250°C x 2hrs (Heating rate : 100 °C/hr)



DAIICHI KIGENSO KAGAKU KOGYO CO., LTD.

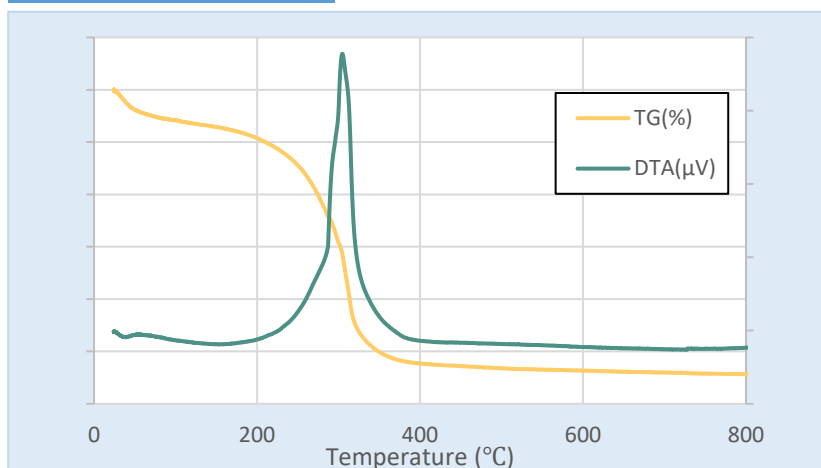
<https://www.dkkk.co.jp/english/products/index.html>

Sales department
+81-6-6231-3835

Characteristic Data③

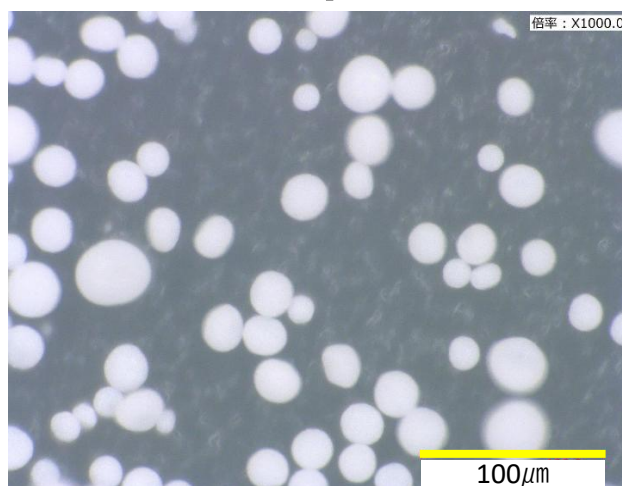
TG-DTA Data

CONFIDENTIAL

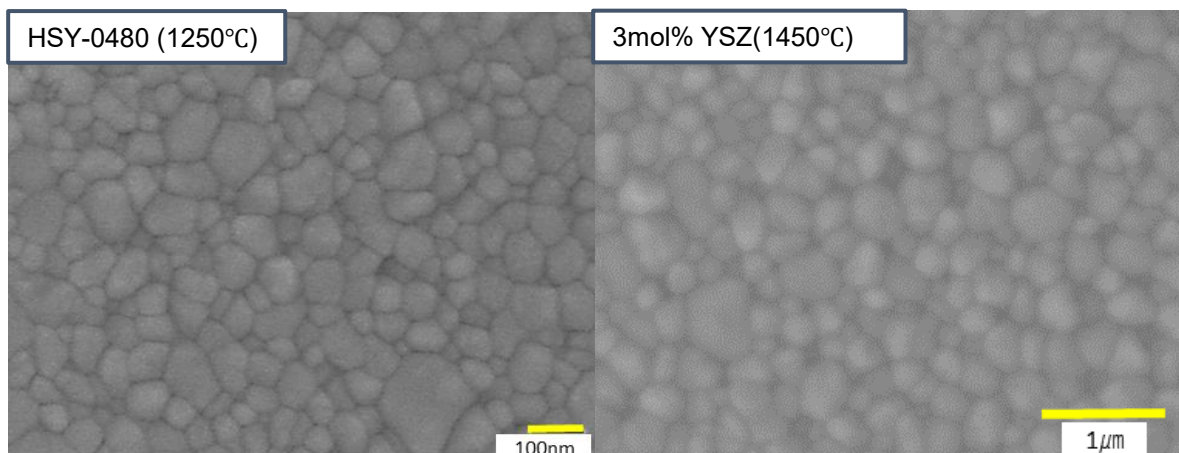


**Weight loss
Approx. 5 wt%
(Binder content)**

Granule Shape



Crystal Grains of Sintered Body



DAIICHI KIGENSO KAGAKU KOGYO CO., LTD.
<https://www.dkkk.co.jp/english/products/index.html>

**Sales department
+81-6-6231-3835**

HSY-0481 Characteristic Data

CONFIDENTIAL

Characteristics of Powder and Sintered Body

- HSY-0481 (binder-free powder grade) is suitable for injection molding / extrusion / tape casting.

	Item	Unit	Analysis Result
Characteristics of Powder	ZrO ₂ +HfO ₂	wt%	97.95
	CaO	wt%	2.05
	Al ₂ O ₃	wt%	0.25
	Fe ₂ O ₃	wt%	0.001
	TiO ₂	wt%	0.001
	SiO ₂	wt%	0.006
	Na ₂ O	wt%	0.007
	H ₂ O	wt%	0.83
	L.O.I (H ₂ O Containing)	wt%	1.65
	Specific Surface Area	m ² /g	23.3
	Bulk Density	g/cm ³	0.97
	Green Density	g/cm ³	2.85
Characteristics of Sintered Body (Sintering temp.:1250°C)	Sintered Density	g/cm ³	5.96
	3-point bending strength	MPa	1000
	Vickers hardness	HV	1100
	Fracture toughness (IF method:294N)	MPa·m ^{0.5}	≥15

※Molding / sintering method

- Molding Method : After uniaxial press molding (9.8MPa), 196MPa, Cold Isostatic Pressing (CIP) molding.
- Sintered at 1250°C x 2hrs (Heating rate : 100 °C/hr)

Please feel free to contact us if you need materials for parts to be used under severe conditions such as high pressure and temperature (water vapor), alkali resistance and acidity.



DAIICHI KIGENSO KAGAKU KOGYO CO., LTD.
<https://www.dkkk.co.jp/english/products/index.html>

Sales department
+81-6-6231-3835