

October 21 2025

Announcement of the development of a ceramic material that combines durability, transparency, and does not rely on rare earth elements

Daiichi Kigenso Kagaku Kogyo Co., Ltd. (Head office: Chuo-ku, Osaka; CEO Hiroshi Kokubu) is pleased to announce that a new calcia-stabilized zirconia material, "DURAZR®-S¹Series, Product Name: HSY®-0774," has been developed.

The "DURAZR®-S Series" is a zirconia powder which can be used to manufacture highly durable ceramic products. Zirconia for this purpose generally uses rare earth elements such as yttria as a stabilizer. However, these rare earth elements are only produced in a limited number of countries, making stable procurement a challenge. The newly developed product successfully uses calcia (calcium oxide), which is easily available, as a stabilizer. As it does not use rare earth elements, it contributes to a more stable supply of ceramic products.



Ceramic sintered body
using newly developed products

In addition, ceramic products made from this newly developed material maintain the high durability as the DURAZR®-S series while exhibiting high transparency. This high aesthetic appeal makes it suitable for use in jewelry components and other applications.

<Features of the newly developed product>

1. Stable supply with no rare earth elements

While calcia, which is used as a stabilizer, is easy to procure, it does not maintain its functionality at the high sintering temperatures of ordinary ceramics, making it difficult to use for this application. Our newly developed product uses our proprietary ATEDZ technology² to achieve low-temperature sintering, at temperatures approximately 200°C lower than normal. This makes it possible to use calcia as a raw material.

The newly developed product does not use rare earth elements, which are produced in limited countries, and the zirconium raw material can be steadily procured through our own supply chain, ensuring a stable supply.

2. Durability and high transparency

As part of the DURAZR®-S series, it has the high strength (the material's inherent resistance to destruction) and contributes to the further miniaturization and thinning of structures. In addition, it has hydrothermal degradation resistance, which makes it difficult for cracks to occur even in environments (temperatures of around 100°C) where the use of zirconia ceramics was previously considered unsuitable, making it possible to produce highly durable ceramic products. In addition, by optimizing the composition of the newly developed product, we have succeeded in increasing the transparency of the ceramic product. By sintering using HIP sintering³, we have achieved high transparency while maintaining high durability.

<References>

1 About the DURAZR®-S series

This is a series of zirconia powders used as materials for ceramic products. In addition to being able to produce ceramic products with high strength and high toughness (resistance to cracks when force is applied), it is also characterized by the fact that it can be sintered at lower temperatures than usual (low-temperature sintering), which contributes to reducing CO₂ emissions during the manufacturing process.

Since January 2023, we have been selling these series (product name: HSY®-0480). In addition to the features of the series, this product does not use rare earth elements as a stabilizer and is resistant to hydrothermal degradation, even in hot water environments. Ceramic products made with this product are expected to be used in a wide range of applications, including industrial equipment such as semiconductor manufacturing equipment, various structural components such as screws and bolts, and the automotive industry for EVs (electric vehicles) and FCVs (fuel cell vehicles). In addition, it is expected that the replacement of components that were previously made of metal will result in weight reduction and improved insulation (resistance to electrical conduction).

- News Release January 23, 2023

DURAZR®-S Series HSY®-0480

Announcement of new development of zirconia ceramic material, achieving approximately three times the toughness of conventional materials]

https://ssl4.eir-parts.net/doc/4082/ir_material3/199761/00.pdf

*released only in Japanese

2 ATEDZ technology

The abbreviation of Advanced Toughness and Easy-sintering DKK Zirconia technology. This technology synthesizes powder that can be sintered at 1200-1300°C, 200°C lower than the conventional sintering temperature (1400-1500°C). Low-temperature sintering makes it possible to realize compositions with zirconia ceramics that were previously unattainable.

3 HIP Sintering

An abbreviation for "hot isostatic pressing," this is a heat treatment process that uses high-pressure gas such as argon to simultaneously apply high temperature and isostatic pressure to ceramic parts to obtain denser ceramic products.

<Contact for inquiries regarding this matter>

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