

## Development of Sustainable Materials Utilizing Waste

### —Success in producing zeolite from waste liquid left from growing synthetic quartz crystals—

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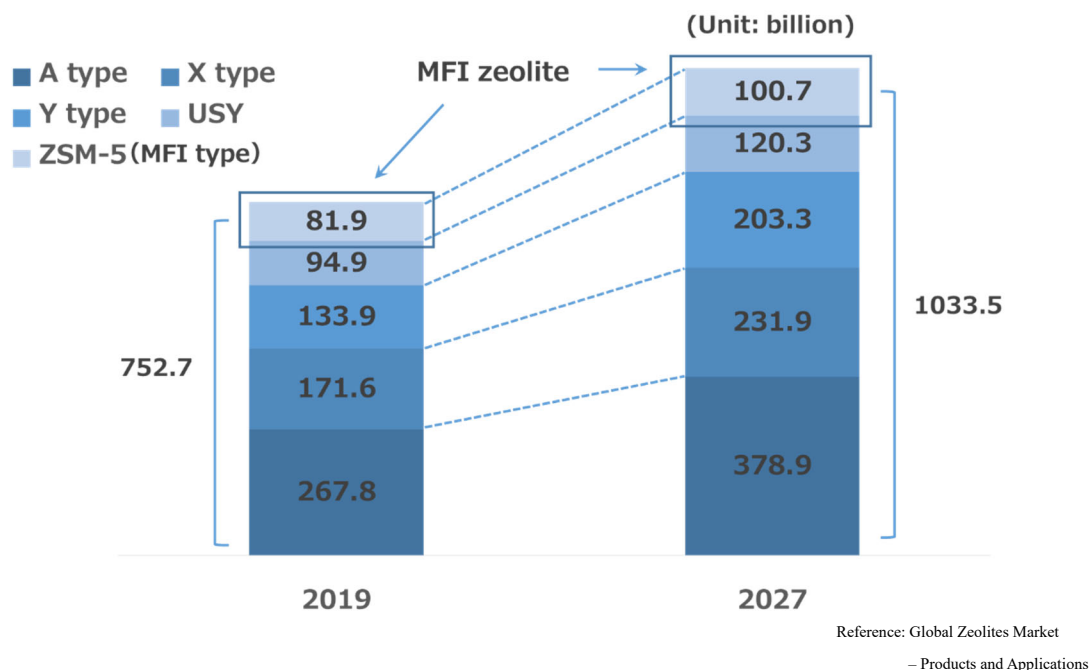
**DAISHINKU CORP.**

Daishinku Corp. is working on the development of crystal growth technology based on the company's core technology, growing synthetic quartz crystals, according to the “new crystals” initiative as part of the 10-year, long-term management plan OCEAN+2 Strategy formulated in 2019. The company has had success in synthesizing zeolite from the solution left from growing synthetic quartz crystals (hereinafter referred to as “waste liquid”).

Zeolites are crystals containing silicon and aluminum and exist in many forms. The different forms of crystals have holes of various sizes inside the crystal, and their uses differ depending on the size of the holes. The applications for zeolites are diverse. They are used as a dehydration material and an ion adsorbent due to their *molecular sieve action*<sup>1</sup> and *ion exchange action*.<sup>2</sup> They are also used as a solid acid catalyst<sup>3</sup> in the petrochemical industry.

Therefore, noting the fact that silicon—the main component of zeolite—is dissolved in the waste liquid left from growing synthetic quartz crystals, Daishinku has worked on the synthesis of zeolite using this waste liquid, which has resulted in success in synthesizing several types of zeolite. The market for synthetic zeolite is expected to grow to approximately ¥1 trillion by 2027. Specifically, the market for MFI zeolite, which is high value-added and can be used as a petroleum refining catalyst, was valued at approximately ¥80 billion in 2019 and is expected to grow to approximately ¥100 billion by 2027.

Currently, Daishinku aims for the production of MFI zeolite. Because the amount of zeolite that could be produced from waste liquid was small in view of the market size, it was necessary to develop a method that could produce it more efficiently. Therefore, by applying its expertise built through synthetic quartz crystal growth technology, the company has had success in developing a technique that can produce a large amount of zeolite at low cost at the laboratory level. In addition, since hydrothermal synthesis is used to synthesize zeolite, the synthetic quartz crystal growth furnace owned by the company can play a significant role. Mass production will be launched in the future utilizing the synthetic quartz crystal growth furnace currently out of service. In this way, Daishinku will strive to enter new markets with low-cost, competitive products, making effective use of waste and idle assets.



**Fig. 1: Market forecast for synthetic zeolites**



**Fig. 2: Rendered image of zeolite synthesis from waste liquid**

[Start of mass production (planned)]

During FY 2025

[Terminology]

1. Molecular sieve action: A function that separates molecules larger than the size of the pores of zeolite from those smaller than that size.
2. Ion exchange action: Zeolite has cations (positively charged ions) in its crystal structure, and these ions can be easily exchanged. The ion exchange action is a function that adsorbs unwanted ions present in an aqueous solution and releases the ions originally contained in the crystal.
3. Solid acid catalyst: A solid substance whose surface has areas exhibiting acidity (proton-donating function) acting as an acid catalyst.