

NGK's honeycomb structures and DAC

Honeycomb structured ceramics could be very effective for direct air capture, reducing energy costs of air circulation and providing a high surface area. NGK INSULATORS, a manufacturer of honeycomb ceramics for removing pollutants from vehicles, explains more.

NGK's monolith ceramic honeycomb substrates provide a robust solution for solid sorbent DAC systems to effectively capture and utilize CO₂ while minimizing operational energy expenses. NGK INSULATORS, LTD, a company with a 100-year history of producing ceramic materials such as for automotive exhaust gas purification, and a specialist in ceramic honeycomb structures, discovered that their unique and established honeycomb structured carriers are a promising solution to DAC challenges.

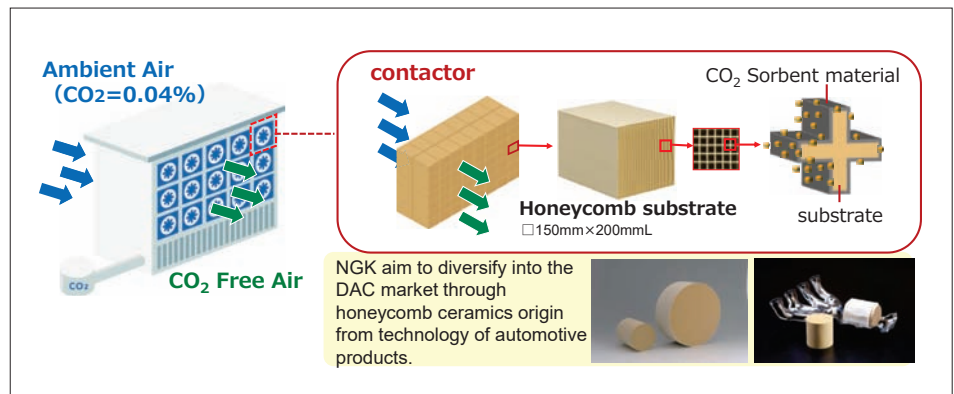
NGK's HONEYCERAM is probably not a household name to many outside the industry. However, it is in fact used in about half of the cars on the road today to purify harmful pollutants such as HC, CO, and NO_x in exhaust gas. Indeed, NGK's honeycomb ceramic carriers are mass-produced in 12 factories in 9 countries worldwide.

NGK has embarked on research and development to apply their honeycomb structure HONEYCERAM to DAC. NGK's thin-wall honeycomb ceramics have low air resistance and high specific surface area. When passing through the angular honeycomb ceramic, which acts as the contactor, CO₂ can be adsorbed and collected by the sorbent applied to the honeycomb structure, play an important role in meeting net zero goals.

Potential Use Case

The advantages of NGK's ceramic honeycomb include a large specific surface area and low pressure loss, as well as the ability to control thermal capacity, cell structure/pore microstructure, and maintain durability. Furthermore, it is proven reliable technology and has the potential to be extremely cost effective, as it is already a mass-produced product and reusable. NGK's ceramic honeycomb have been proven to survive in harsh conditions. NGK is confident they can be reused multiple times after the end of the sorbent's full useful life.

Compared to a packed bed reactor (PBR), honeycombs have the advantage of being much lower pressure loss (1/50th of a PBR) and lower thermal capacity (1/3rd of a PBR),



which can reduce the energy required for ventilation and heating.

In addition, the pore structure of honeycombs are controllable, and can be precisely tailored to the physical requirements of each unique sorbent. NGK's honeycomb ceramics would be suitable for solid sorbent DAC systems.

Collaborative Partnerships

NGK is working on collaborative research and technology evaluations with DAC companies including DAC plant players, research institutions, and startups with novel sorbent technologies.

What are the potential collaboration possibilities with NGK? For example, a company could explore the possibility of incorporating honeycomb ceramics in plant design through collaboration with DAC plant designers, or combine CO₂ sorbents and their support materials with development companies. NGK's core competencies extend beyond our product technology into simulation technology, quick sample lead times, and well established support teams within our North American and European group companies.

"We aim to create new supply chains together with partners for the development of DAC solutions," Shigeru Kobayashi, President, NGK Insulators stated. "In 2025, NGK together with our partners aim to conduct demonstration experiments with partners and ultimately scale up our technology into DAC plants at the level of several hundred to several thousand

tons of CO₂ per year." To accomplish this NGK is showing a proactive attitude towards collaboration with its partners.

About the company

NGK INSULATORS, LTD. (NGK) is a leading company in the field of ceramics. Since its foundation in 1919, NGK has used its unique ceramic technology to provide numerous ground-breaking products that solve societal issues.

As one of the largest manufacturers of ceramic substrates for automotive catalytic converters, NGK has built on this to also develop new products and businesses with ceramics that actively reduce the strain on the global environment.

NGK provides the energy storage system "NAS" batteries – vital tools for sustainable energy infrastructure. It also provides a compact, thin, and high-energy-density lithium-ion rechargeable battery through its "EnerCera" product line, contributing to IoT.

NGK focuses on the two business fields "carbon neutrality" and "digital society" and is aiming to realize 80% of total company sales in these two fields whilst also achieving net-zero CO₂ emissions by 2050.

 **NGK INSULATORS**

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