



Message from the Director in Charge of Research and Development of New Businesses



We will contribute to decarbonization through persistent long-running development activities.

Yusuke Narumi *Director, Officer, Department Manager, New Business Development Department*

Develop new technology that contributes to decarbonization

◆ Develop in-house recycling ecosystem based on “chemical looping”

The TOK Group achieves decarbonization through business by providing semiconductor miniaturization materials, 3D-NAND materials, and power semiconductor materials. As a new initiative, we strive to develop an in-house recycling ecosystem based on chemical looping.

◆ Collect super-high-concentration CO₂ without using air for reaction

TOK discharges organic solvent effluents generated in the manufacturing process after partial recycling, combustion, and detoxification. Usually, the separation and recovery of CO₂ through the normal combustion of effluents in the air takes considerable energy because the CO₂ in the exhaust gas is only approximately 13%* due to the large shares of atmospheric O₂ and N₂ that are not used for combustion. In addition, atmospheric N₂ is oxidized through combustion. In general, a thermal power plant is considered to emit 30 to 100 ppm of thermal NOx after denitration treatment.

In contrast, TOK is developing a system based on chemical looping, where atmospheric oxygen is not used in the reaction, and high-concentration CO₂ can be selectively collected by controlling and optimizing reactive conditions. This system can also minimize thermal NOx because the reaction temperature is lower than for normal combustion. Investigations using present experimental equipment have indicated a CO₂ conversion efficiency of 95% or higher and a NOx level of approximately 1 to 10 ppm (lower measurement limit at present), demonstrating the superiority of this system. Currently, joint research with universities and other research institutions is in progress toward in-house practical application of this system. Subsequently, we will also pursue energy recycling and CO₂ conversion linked to this system.

The system still has many problems to clarify, we will persistently continue with long-running development as our characteristic as part of our contribution to decarbonization.

* Calculated values



Hiroshi Kumazawa
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Visualize benefit to enhance motivation for development toward decarbonization

The general policy speech by Prime Minister Suga in October 2020 signaled the start of initiatives to achieve carbon neutrality by 2050. At the Intergovernmental Panel on Climate Change (IPCC) 2013, it was clarified that zero emissions were the only means to stop climate change. After the Paris Agreement took effect in 2016, decarbonization has become the global policy target instead of low carbon. We believe that this is a social requirement that affects the survival of humankind.

TOK is developing a system based on chemical looping as its new business, which can convert waste into items of value by using effluents as fuels, in addition to the collection of CO₂. We recognized that the visualization of benefits from environmental initiatives enhance motivation for development. Because the handling of high-concentration CO₂ involves hazards, we will promote development with due safety considerations as a player in the carbon neutral society.