

## N.E. CHEMCAT Business Fields

We contribute to achieving a sustainable and quality global environment and affluent society by providing catalysts. Our catalysts support a wide range of industries, including petrochemicals, pharmaceuticals and agrochemicals. They are also used to protect the environment by contributing to environment purification and resource recycling.

### Process Catalysts

Process catalysts are used for accelerating chemical reactions or selectively producing specific compounds, and are indispensable for industrial manufacturing. We develop and manufacture process catalysts used in a variety of fields, from energy plants to the manufacturing of pharmaceuticals, agrochemicals, fertilizers, and organic electroluminescence. Through these activities, we provide support to many aspects of society, from cutting-edge industries to the everyday lives of citizens.



### Products



#### Fine Chemical Catalysts

Fine chemical catalysts are used in the process of manufacturing high value-added chemicals such as pharmaceuticals and agrochemicals. They are used to produce antidiabetic and antihypertensive medicine, antibiotics, and other medicine, and improve agricultural productivity, thereby supporting the lives of everyone. Fine chemicals also require a high degree of purity and are manufactured through production processes that involve many stages and which generate a great deal of waste. There have been demands to reduce waste generation in recent years and fine chemical catalysts possessing high activity and selectivity are contributing to more efficient production with a lower environmental impact.



#### Gas Purification Catalysts

Gas purification catalysts refine inert gas to an ultra-high degree of purity by removing minute impurities such as oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), hydrogen (H<sub>2</sub>), and moisture. The catalysts are used in the chemical, steel, machine, and many other industries with a high need for ultrapure gas. We are also developing methanation to recycle CO<sub>2</sub> and produce methane, the main raw material in city gas, and other carbon recycling technologies aimed at achieving carbon neutrality.



#### Petrochemical Catalysts

Catalysts are essential to the petrochemical and petroleum refining processes and have contributed greatly to the development of the industry to where it is today. We support affluent living by providing the catalysts needed to produce basic chemicals used in manufacturing apparel, carpet, plastics, and other petrochemical products, as well as catalysts that serve as the raw material for the gas barrier films widely used in food packaging and for other purposes in recent years.

Providing value to society

Supporting industrial development and flourishing lifestyles

### Exhaust Catalysts

Substances emitted from plants and other stationary sources and from the internal combustion engines of vehicles and other machinery are harmful to the environment and to the human body. Exhaust catalysts convert such harmful substances into harmless substances through chemical reactions and thereby make a substantial contribution to solving air pollution and other environmental challenges.



### Products



#### Stationary Off-Gas Treatment Catalysts

The hydrocarbons (HC) and carbon monoxide (CO) contained in industrial emissions are the main sources of air pollution and are a big problem for society as whole. N.E. CHEMCAT helps to prevent air pollution by providing DASH catalysts that remove volatile organic compounds (VOCs) and other contaminants contained in exhaust gas from plants and recover and reuse the thermal energy emitted from them.



#### Gasoline Auto Exhaust Catalysts

Gas exhaust from gasoline engines contains carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO<sub>x</sub>), which are harmful substances. We help to prevent air pollution by providing three-way catalysts that convert these harmful substances into the harmless substances, carbon dioxide (CO<sub>2</sub>), water (H<sub>2</sub>O), and nitrogen (N<sub>2</sub>). Regulations on vehicle emissions and fuel efficiency continue to grow stricter worldwide year after year. We are working to prevent global warming and solve environmental challenges by working together with automotive manufacturers to develop and manufacture high-quality catalysts that have superior durability and good purification performance, and low-temperature and high heat-resistance performance.



#### Diesel Auto Exhaust Catalysts

Diesel engines emit less CO<sub>2</sub> than gasoline engines, but exhaust higher amounts of sulfuric acid mist, other particulate matter (PM), and nitrogen oxides (NO<sub>x</sub>), in addition to soluble and insoluble organic compounds. To address these problems, we are developing and manufacturing catalysts that can be adapted to various post-treatment systems such as diesel particulate filters (DPF) to capture particulate matter (PM) and convert into CO<sub>2</sub> and selective catalytic reduction (SCR) catalysts to treat nitrogen oxides (NO<sub>x</sub>). These catalysts render such substances harmless and help to protect the global environment.

Providing value to society

Promoting a livable planet by eliminating substances that are harmful to humans and nature

## N.E. CHEMCAT Business Fields

### Catalysts for Fuel Cell Applications

Fuel cells, which generate electrical energy through the reaction of hydrogen and oxygen, are attracting increasing attention as a clean energy technology. We develop and manufacture electrocatalysts for fuel cell vehicles (FCVs), and reforming catalysts and preferential oxidation (PROX) catalysts needed to produce hydrogen gas, and we are working to develop a hydrogen-based society.

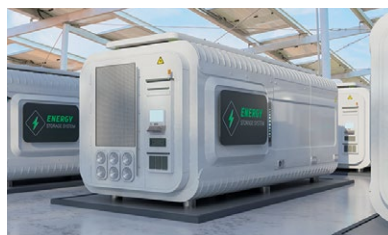


#### Products



#### Catalysts for FCVs

We develop and manufacture electrocatalysts for FCVs, which are drawing interest as zero-emission vehicles that will help achieve carbon neutrality. We are focusing on improvement of platinum catalysts and development of next-generation catalysts (platinum alloy catalysts and platinum core-shell catalysts) and are contributing to resource recycling up to precious metal recovery from electrocatalysts.



#### Electrocatalysts for Stationary Use

Fuel cells use hydrogen to generate heat and electricity, and are an essential system for hydrogen use. For stationary fuel cells, we develop and manufacture reforming catalysts that convert methane to hydrogen, such as catalysts needed to produce hydrogen from city gas, and PROX catalysts that remove carbon monoxide (CO). We will continue our work to provide catalysts offering even high performance and will support the proliferation of clean energy as the demand for it continues to grow in the future.



#### Catalysts for Hydrogen Value Chain

The use of catalysts is being considered for each step of hydrogen production, storage, transport, and use. Reforming catalysts and PROX catalysts are used in the production process, and the use of catalysts is also promising for the technology to extract hydrogen from hydrogen carriers in the storage and transport steps. Catalysts are also effective at removing nitrogen oxides (NOx), nitrous oxide (N<sub>2</sub>O), and other harmful substances generated by mixed combustion of hydrogen and ammonia (NH<sub>3</sub>) during use. These hydrogen-related catalysts support the hydrogen value chain and help solve environmental, resource, and other social challenges.

Providing value to society

Facilitating the adoption of clean energy and promoting a sustainable society

### Precious Metal Recycling

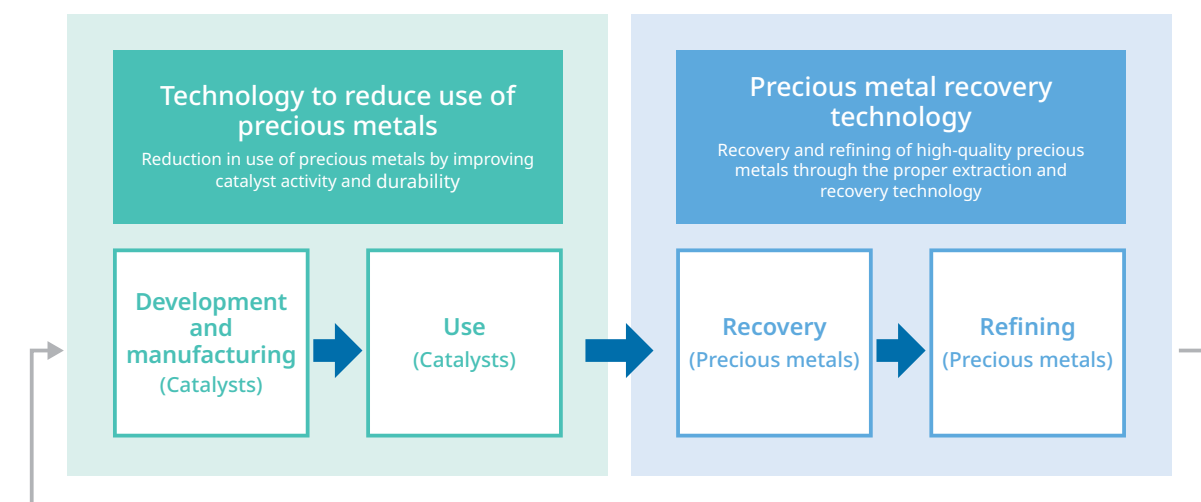
N.E. CHEMCAT separates and recovers precious metals from spent catalysts, including platinum (Pt), palladium (Pd), rhodium (Rh), ruthenium (Ru), and gold (Au). Our proprietary process allows impurities to be removed and the precious metals to be refined to a high degree of purity.

We also have precious metal reduction technology to formulate catalysts that use fewer precious metals while offering performance that is equal to or better than conventional catalysts. We are helping to conserve scarce precious metal resources by providing integrated services, from the development and manufacture of catalysts to the recovery and refining of precious metals.



#### Initiatives

#### Initiatives Targeting Effective Use of Precious Earth Resources



The Numazu Plant has been involved in the business of recovery and refining of precious metals since N.E. CHEMCAT was first established.

In addition to metal recovery, our recycling technology is also used for refining high-purity adsorbents for waste treatment and high-purity semiconductor encapsulants and raw materials for encapsulants.



Providing value to society

Promoting the effective use of scarce resources and helping to build to a recycling-oriented society