Catalyst and Sorbent Development

Catalyst and sorbent development is an integral part of RTI International's process development activities for the chemical, petroleum refining, transportation, and power production industries. Specifically, our expertise lies in the simultaneous development of suitable catalysts or sorbents for specific process applications. We have developed sorbents to remove sulfur and heavy metals from synthesis gas and hydrocarbon gas streams. We have also produced novel catalysts for the conversion of fossil- and biomass-derived syngas to liquid fuels and chemicals. In addition, we offer comprehensive catalyst and sorbent synthesis, characterization, and testing services to industrial and government clients.

Catalyst and Sorbent Synthesis

Catalysts and sorbents are integral to RTI's process development activities. For more than two decades, RTI has developed novel supported-metal catalysts, mixed-metal oxide catalysts, zeolites, and FCC catalysts to solve challenging, energy-related problems. RTI has assembled the scientists and facilities necessary to maintain a world-class catalyst synthesis program. The flexibility of our resources allows for the synthesis of different types of catalysts and sorbents by various synthesis techniques—co-precipitation, impregnation, spray drying, and pelletization, among others. RTI has particular expertise in developing highly active and physically strong catalysts—properties that tend to be mutually exclusive during development. RTI has developed novel techniques for producing highly active and physically strong catalysts and sorbents for fast-fluidized or circulating reactor systems.

The backbone of RTI's catalyst synthesis program is a large wet-chemistry laboratory that is fully equipped with laboratory- to pilot-scale equipment for the production and optimization of catalyst formulations. Specialized equipment includes a Niro Mobile Minor spray dryer used for spray drying between 0.1 and 2.0 kg batches of catalyst and sorbent material. For fixed-bed reactor applications, RTI uses a 2.25-inch Bonnot extruder for preparing catalyst pellets of many shapes and sizes.

RTI has developed and scaled up a number of catalysts and sorbents for a variety of applications, including the following:

- Desulfurization sorbents for high-temperature syngas
- Regenerable carbon dioxide capture sorbents
- Iron-based Fischer-Tropsch catalysts
- Naphtha and diesel desulfurization catalysts
- Sorbents for multi-contaminant (e.g., Hg, Cd, Se, As) removal from high-temperature syngas
- Sorbents for HCl removal
- Catalysts for NH_3 adsorption/decomposition

Catalyst and Sorbent Characterization

Catalyst characterization facilitates the rapid optimization of both a production process and catalyst composition with targets of maximum activity and superior physical properties. RTI's capabilities in catalyst characterization complement the catalyst synthesis and development program. A wide range of analytical equipment is available to our researchers, allowing them to effectively evaluate and screen novel catalyst preparations.

RTI has world-class facilities for catalyst and sorbent characterization:

- Brunauer-Emmett-Teller surface area
- Pore-size distribution
- Attrition resistance
- Scanning electron microscopy
- Transmission electron microscopy
- Particle-size distribution
- Thermogravimetric analysis (atmospheric and high pressure)
- Differential thermal analysis
- Differential scanning calorimetry
- Temperature-programmed reaction and temperature-programmed desorption
- Inductively coupled plasma mass spectroscopy
- X-ray diffraction

Catalyst and Sorbent Testing

Analytical characterization is not always enough to evaluate a catalyst's true performance in a suitable reactor environment. To address this issue, RTI has a variety of reactors, including fixed-bed, fluidized-bed, continuous stirred tank, and slurry bubble column reactors, ranging in size from micro-reactor to 5-inch diameter, to test catalysts for their selectivity, activity, and durability. RTI maintains a sophisticated laboratory that includes the ability to test catalysts in reactor systems covering a wide range of temperatures and pressures. Our testing capabilities include blending various reactive, corrosive, and toxic feed compositions and analyzing effluent compositions using different gas chromatographs and continuous analyzers.

Catalyst and Sorbent Production and Scale-Up

RTI maintains a philosophy of adapting commercial and scalable production practices early in the catalyst development process. We also have close relationships and work experience with all major commercial catalyst manufacturers. This approach results in the straightforward and rapid scale-up of a majority of catalysts and sorbents developed at RTI.

Doing Business with RTI

RTI offers comprehensive catalyst and sorbent development and testing services to industrial and government clients, aiming to provide the most efficient, and cost-effective R&D services possible. RTI takes a pragmatic approach to managing intellectual property to best serve clients' needs and has the necessary systems in place to best serve clients' needs.

More Information

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