

Thought Leadership > Competitive Benchmarking > Technology-driven Business Strategies



Depth of Knowledge > Technical & Commercial Developments > Strategic Reassessments

THE INDUSTRIAL ADSORBENTS BUSINESS – 2022 UPDATE: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂

Multi-Client Study Proposal

May 2022

THE INDUSTRIAL ADSORBENTS BUSINESS – 2022 UPDATE: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases And GHG/CO₂

ABSTRACT

This proposed study will be an update to, and expansion of, TCGR's well-received 2013 assessment of the industrial adsorbents industry, "***The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas and Industrial Gases***," which was designed to document the markets, competitive landscape, technology advancements and strategic opportunities. It will also leverage the insights captured in two (2) of TCGR's more recent efforts in these areas, the 2019 and 2017 editions of "***THE SEPARATIONS REPORT: Commercial, Technical and R&D Assessment in Refining, Petrochemical/Syngas, Natural Gas and Industrial Gases***." In recognition of the rapidly advancing situation for adsorbents applications in CO₂/GHG mitigation, the study will also build on the insights in techno-economic reports completed as part of TCGR's **CO₂ Capture & Conversion (CO₂CC) Program**, which have assessed materials advancement (e.g., MOFs, COFs, etc.) as well as direct air capture (DAC), among other topics. In this proposed **2022 Update**, we will return to a rapidly developing applications slate – to include newer and fast-growing environmental uses as well as the established, and still attractive, applications. The focus will be exclusively on adsorbents as opposed to other separations approaches such as membranes, distillation, cryogenics, etc., although comparisons will be made. This study is essential for industry participants and observers considering investment, as well as to process technology companies evaluating the industrial adsorbent process markets.

An update on the process industries, including refining, chemical/syngas, natural gas and industrial gases – but also now CGHG/CO₂ separations - is well overdue. While smaller studies are available covering individual alumina, activated carbons etc., none of these provide sufficient commercial focus and depth for the industrial practitioner. TCGR's in-depth study will assess the commercial landscape of the industrial adsorbents business from 2022 to 2030. The study produced "**by the industry, for the industry**" will be the first independent market application build-up analysis performed in last ten (10) years. TCGR's proposed study will analyze the industry's growth industry segments from a business development opportunity and technical R&D perspective(s) internationally. No other offering is available that contains this hands-on industrial experience.

I. INTRODUCTION

Separations and purifications within industrial processes have become more demanding, thus more important, than ever! This is the result of both new/recent developments as well as some long-standing trends. The first is the source of feedstocks, whether fossil (e.g., heavy oil, natural gas, etc.), bio-based (cellulosic) or circular (e.g., recycled plastics, CO₂-based flue gas, etc.), are presenting increasingly more challenges, whereas the need for purer intermediates and final products continues to rise. This is due in part to higher yields, more sophisticated process technologies and techno-economic requirements from manufacturing. The second is the more recent recognition that separation/purification is a very energy intensive requirement. In today's environment with

expectations for reduced energy consumption and improved process costs, it has become urgent to save energy (and raw materials) and reduce the CO₂ footprints of processes. As a result, significant attention is being placed on materials and energy improvements in separations. Membranes and adsorptive-based processes, and hybrids of both, are being considered as replacements for traditional distillation and cryogenic distillation processes now broadly used.

More so than ever, industrial adsorbents play a vital role in today's state-of-art petrochemicals/chemicals, liquid fuels, and gases production. They are also an increasingly important component in the capture and clean-up of GHG/CO₂ from flue gases (as part of the drive to NetZero and other ESG-related commitments). Until recently, these materials seem to have garnered less attention than catalysts and reactor/process technologies, perhaps because the market by many has been considered mature – this is by no means any longer the case! From both a scientific and industrial perspective, adsorbents are poised to play an increasingly value-added role. Now and in the near future, more focus will be placed on removing methane. Global methane emissions have grown twice as fast as CO₂ and methane removal solutions are becoming more of the focus for R&D. Globally, stopping methane leaks from oil and gas systems would eliminate as much warming as removing every car in the world! Adsorptive processes are especially suitable and should be part of the solution set since the concentration of the methane in the atmosphere is low in concentration (1800 – 1900 ppb).

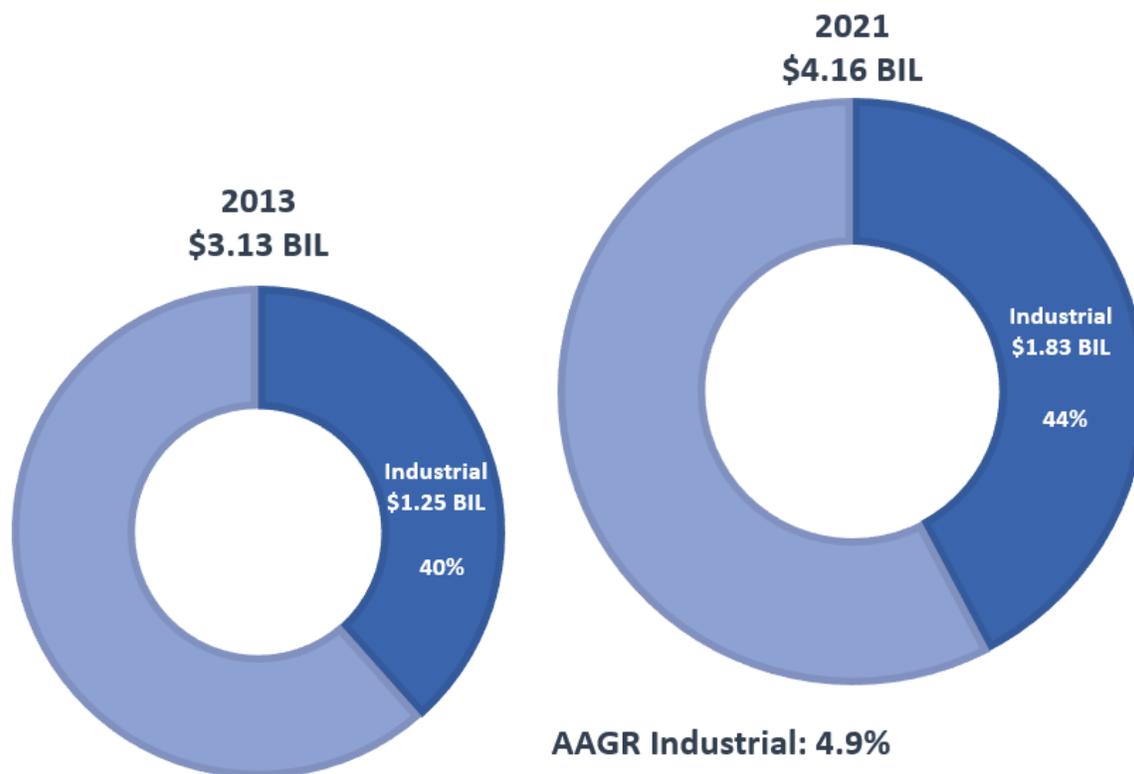
To date, there have not been sufficiently reliable business studies which characterize, as well as document the current size and growth of this market, in part because process licensors within OECD dominated the applications with packaged systems, i.e., wrapped up as part of the process license. **Now that this business opportunity is viewed as a global application, with a broadening potential endues slate (to include post-combustion GHG/CO₂ clean-up and methane capture), it quickly becomes apparent there is significant opportunity to garner value, through two actions: (1) by delivering improved and innovative materials serving rapidly evolving applications; and (2) by providing improved cost/performance solutions.**

In this proposed study, The Catalyst Group Resources (TCGR) will provide industrial practitioners with the best independent market application build-up analysis performed in the last ten (10) years. It will discuss the major changes and future opportunities in the markets and the landscape of adsorbent suppliers. It will be assembled by a team of industry professionals with over one hundred combined years of commercial experience, from natural gas, industrial gases and process licensing businesses. As they did with the 2013 assessment, subscribers will appreciate the challenges presented by such a fragmented marketplace, acknowledging the know-how and the methodical approach used to complete this benchmarking work.

II. BACKGROUND

While adsorbents find diverse uses in water purification, refrigeration, home construction, beverage, food and health and drying applications, industrial adsorbents are critical materials to the separation, purification and dehydration of hydrocarbons, industrial gases and GHG/CO₂-containing emissions. With the increased emphasis on higher quality products and the expected improvement of energy efficiency and contaminant control, adsorbents and enhanced processes to use them are becoming more important than ever (see Figure 1).

Figure 1 – Industrial Adsorbents Market: \$1.83 BIL in 2021; 4.9% CAGR



Other includes: Water purification, beverages, food, edible oils, detergents

Traditional adsorbents include natural materials (e.g., clays, activated carbon and silicas), but increasingly they are synthetically engineered products such as zeolite molecular sieves (ZMS), modified aluminas, metal oxides and MOFs. These molecular and functionally modified surfaces provide increased selectivity and working capacity for contaminant removal. Increasing performance demands are requiring value-added product approaches and there is a continual search for improvements, which stimulates R&D for novel materials.

In the refining, chemicals/syngas, natural gas, industrial gases and GHG/CO₂ segments, known as the “process industries,” there are a number of global suppliers as well as a number of niche players, as shown in Table 1. These include process licensors where specialties demand royalties (e.g. UOP/Honeywell or Axens), as well as suppliers of advanced materials commanding premiums but also commodities.

Information from suppliers is openly provided for important applications in refining, petrochemicals and natural gas. However, little is readily available for the practitioner/end user to compare the relative merits of products offered between suppliers. In addition, from a supplier’s competitive benchmarking perspective, little is easily available for comparative purposes between suppliers’ equivalents. This proprietary industrial nature and complexity has significant implications on technological and commercial progress and is a major impetus for this study.

Table 1 – Large Adsorbent Suppliers, by Material

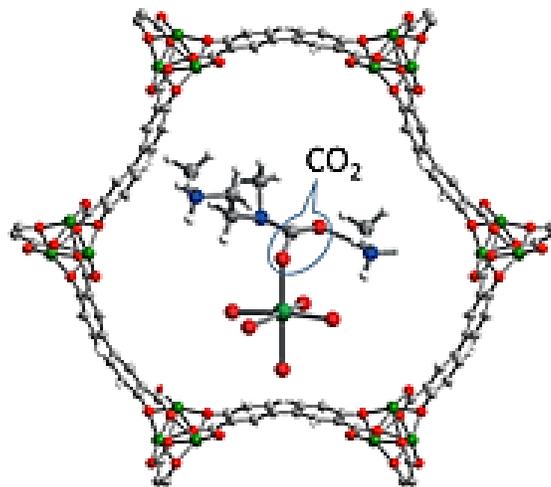
	UOP	BASF	Arkema	Clariant	JM	Zeochem	Calgon	Axens	Norit	Grace	Ecovyst/PQ	MeadWestvaco	EP Clays	Porocel	Chinese Various
Alumina	▲	LDR	▲			▲		▲						▲	▲
Mol Sieve	LDR		▲			▲		▲		▲					▲
Silica		▲								LDR	▲				▲
Clay				LDR									▲		▲
Metal Oxide	▲			LDR	▲										▲
Activated Carbon			▲			▲			LDR			▲			▲
MOF		LDR													▲

A snapshot of the progress in technological and commercial developments in just the past few years reflects an ongoing commitment to gains along with a strong interest from industry to consider and evaluate the offerings. The following developments justify more careful consideration for documentation in TCGR’s proposed study:

- Natural materials (e.g., clay, activated carbon, silica, etc.) once dominated the adsorption field, but now engineered materials such as zeolite molecular sieves (ZMS), modified aluminas and metal oxides have gained significant market share, especially in applications that benefit from increased performance. Newer materials like MOFs, COFs and ZIFs are finding increased attention. The value provided by these advanced engineered adsorbents justifies a premium and warrants this timely update on the new developments within the technologies and markets.
- Ingevity has partnered with natural gas equipment provider Ozinga Energy to use its Nuchar™ Fuelsorb™ carbon-based adsorbents in a line of natural gas-fuel vehicles. The use of adsorbed natural gas reduces the pressure of the stored gas and allows for a 50% increase in the volume of stored gas (Ingevity, 2020).
- Well established Biogas upgrading, via adsorptive separation, continues to advance. Xebec is testing a composite sorbent technology developed by Lawrence Livermore National Lab based on silicone and a carbonate composite material that reacts with CO₂ in the presence of water to remove CO₂ from biogas. (Lawrence Livermore National Lab., 2019).

- The high level of natural gas production prior to the pandemic provided incentive for developments in natural gas purification and separation. BASF launched Durasorb™ HG, a mixed metal oxide containing a promoted copper sulfide phase for mercury removal from natural gas and Durasorb HRU for removal of BTX components from liquified natural gas. Durasorb Cryo-HRU has been qualified by Shell for use in LNG production plants (*Hydrocarbon Engineering*, 2020).
- Climate change and activities directed at achieving NetZero continue to be a driver for technical development. ExxonMobil and Mosaic Materials have partnered to use Mosaic's MOFs to separate carbon dioxide from air or flue gas (*Green Car Congress*, 2020).

Figure 2 – MOF for Carbon Capture



MOF pore structure; the inset shows captured CO₂. Atom colors: oxygen (red), carbon (gray), nitrogen (blue), magnesium (green).

Source: ARPA-E

An improved understanding of the above will assist both suppliers and major end-users in the adsorbents marketplace. **Appreciating the rapidly changing situation for adsorbent application in GHG/CO₂ clean-up, as well as the trend towards monetizing (or making “circular”) these process streams, will help define new market application opportunities for existing players.** These evolving technology advances will continue to lead to an expanded market, with the potential role for adsorbents to be a critical metric.

III. THE NEED FOR THE STUDY

While a number of smaller industry studies are available that document and provide the market sizes and growths of individual materials such as aluminas, activated carbons, zeolites, etc., there have been no studies to match TCGR's initial (2013) assessment that specifically focus on providing an in-depth perspective on the industrial hydrocarbon/gases adsorbent processes and process licensing market, covering all available competing adsorbents. **This capability is a unique skill and knowledge base that only TCGR can assemble.**

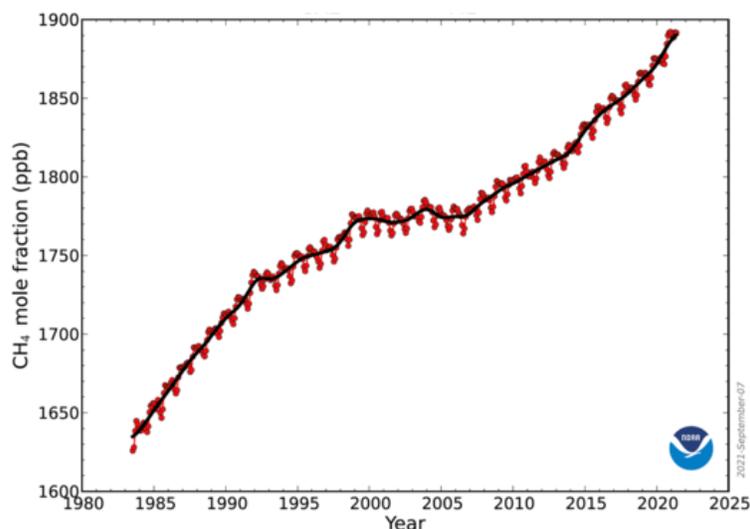
Improved adsorbent separations are increasingly vital to process cost improvements and greater energy efficiency, with the chemical/petrochemical industrial sector contributing over 11% of total CO₂ emissions. Both feedstock and energy costs are rising at the same time that more stringent industrial environmental regulations are being enacted, including CO₂/GHG emissions reductions. This is also providing impetus to improve feedstock pre-treatment and post-treatment standards. Alternatives to and hybrid systems will continue to compete against adsorbent separations, including membranes, absorption solutions and other catalytic destruct systems. Understanding this balance will be important to investment decisions. As a result, there is a significant need, as well as opportunities to be analyzed in this growing commercial application globally, including assessing consolidation.

This study will also discuss the impact on the adsorbent market changes and opportunities due to the following major on-going drivers and events:

- **Climate change and methane capture technologies**

The relative concentration of methane has grown more than twice as fast as that of carbon dioxide since the beginning of the industrial revolution. Methane is 81 times more potent than carbon dioxide in terms of warming the climate for the first 20 years after its release. The bulk of methane emissions are human driven. While the development of methane removal technology won't be easy, the potential rewards are big. (Ref: earth.stanford.edu, Sept. 26, 2021).

Figure 3 – Global Monthly Mean CH₄



Graph shows globally averaged, monthly mean atmospheric methane abundance determined from marine surface sites since 1983.

Image credit: NOAA

- **The use of renewable energy to produce H₂ for utilization both as a more broadly used transportation, industrial and power generating fuel and to transport and store renewable energy.**

- **The use of the same H₂ to produce NH₃ which can substitute for heavier polluting fuels (e.g., bunker C fuel oil).**
- **Similar to the long-standing recycling of lube oils, the emerging Plastics Recycling and Chemical Recycling technologies will need a range of adsorptive processing steps for purifying and upgrading product streams (e.g., pyrolysis oils).**
- **COVID and the resultant step change increase demand for Medical Grade Oxygen**
The WHO's guidance that PSA Oxygen systems product quality fall under the Medical Grade specifications (once solely occupied by cryogenics) and the resulting increase in PSA/VSA adsorbents demand.
- **Demand for EV Batteries and increase in Lithium prices (a key battery and adsorbent raw material)**
Lithium is a key component of rechargeable batteries. The US, and the world, is in a scramble mode to find sources of lithium. This increase in demand affects adjacent industrial uses for Lithium, specifically lithium is a major raw material to manufacture highly exchanged lithium adsorbents for PSA and VSA Oxygen systems for both industrial and medical use.

Figure 4 – Lithium Price Index



Source: WSJ

- **Commercialization of Direct Air CO₂ Capture (DAC)**
The ORCA direct Air capture facility in Iceland uses geothermal energy to remove CO₂ from the atmosphere and store it permanently underground. It is the world's first large scale CO₂ removal plant. The facility consists of eight collector containers with an annual capture capacity of 500 tons each.

Figure 5 – Climeworks ORCA (DAC) Plant



These advances from the past few years are seeing further development today and they will begin to displace incumbent technologies over this study's forecast period (2022-2030).

This proposed **2022 Update**, to be expanded/deepened from the 2013 edition, will compliment an ongoing portfolio of similarly well received studies (TCGR) has delivered to clients over recent years. This growing experience demonstrates TCGR's unique capability, resources and expertise to deliver exceptional insight.

This study compliments an ongoing portfolio of similarly well received studies The Catalyst Group Resources has delivered to clients over recent years. This growing experience demonstrates TCGR's unique capability, resources and expertise to deliver exceptional insight. Recent multi-client studies, limited-client studies and reports from TCGR's membership programs, notably the **Catalytic Advances Program (CAP)** and the **Carbon Dioxide Capture and Conversion (CO₂CC) Program**, include:

- **THE SEPARATIONS REPORT: Commercial, Technical and R&D Assessment in Refining, Petrochemical/Syngas, Natural Gas and Industrial Gases"** (July 2019 and October 2017)
- ***The Intelligence Report: Business Shifts in the Global Catalytic Process Industries, 2021-2027*** (May 2022)
- ***Advances in Direct Air Capture of CO₂*** (December 2019)
- ***Compact Light-Weight CO₂ Capture Technologies for Small- to Medium-Scale CO₂ Emitters*** (September 2019)
- ***Recent Progress in Zeolitic Membranes for Gas Separations and Catalysis*** (December 2016)

- **Benchmarking CO₂ Capture Technology (Vol. 3): Update on Selected Pre-/Oxy-Combustion and Post-Combustion Capture Routes** (September 2016)
- **The Industrial Adsorbents Business: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas and Industrial Gases** (July 2013)

IV. SCOPE AND METHODOLOGY

As depicted in the report's preliminary/proposed Table of Contents on page 10, TCGR's study will begin by completing an overview of the current industry players and the commercial landscape (**Section III**). It will then provide a granular understanding of licensed vs non-licensed processes and products, applications and product properties, ending with supplier profiles and competitive SWOT's of their offerings.

The market size and growth of the process industries 2021-2030, is evaluated by key industry segments, e.g., refining, chemicals/syngas, natural gas, industrial gases and others (**Section IV**). Within those segments increased detail will be provided on licensed process technology vs. non-licensed by delineating the status and advantages of competing processes. New market trends and key commercial developments will also be identified.

Section V – Adsorbent Technical Developments – will document R&D and technical trends through patent analysis, as well as expert review and analysis of recent trade literature and conference proceedings. An outlook on which changes might be expected in the market from technical advances and their future impacts, beyond the status quo will be highlighted.

Sections VI and VII will provide TCGR's unique knowledge and analysis from business development, barriers-to-entry and strategy perspectives. TCGR is known for its unique insights in identifying profit/money making opportunities for its clients. Of particular importance are the trend toward internationalization and the impacts due to new applications in CO₂/GHG and material recycling (e.g., plastics).

TCGR's unique background and historical development roots in adsorbents and adsorption process technologies (ex-Union Carbide and UOP-Honeywell) will provide an unparalleled capability and skill level in this study area. Deep expertise in materials science and process engineering will mean the ability to provide insights beyond other sources, who do not have the industrial experience TCGR and our Dialog Group® network can provide.

For those that understand and appreciate this study undertaking, you will know how important and critically timely this evaluation is! We are standing at a critical crossroads as it pertains to industrial adsorbents. The next 5-10 years are certain to be telling. Thus, TCGR's study is warranted.

In order to heighten the value-added from study participation, TCGR will work with "charter" subscribers (i.e., those who sign-up for the study prior to its formal "launch") in order to define the scope of the report by delineating areas of particular interest for inclusion in the assessment (see Sections III-V). For details on the study scope, the report's preliminary/proposed Table of Contents appears on the following pages.

The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂

Proposed Table of Contents *

- I. **Background/Introduction**
 - Commercial History and Key Issues
 - Players and Drivers
 - Technology State-of-the-Art
- II. **Executive Summary**
- III. **Commercial Landscape and Supplier Portfolios**
 - Applications and Product Properties by Supplier
 - Key Applications by Process. Leading Licensors
 - Supplier Profiles by Company, SWOT's
 - Generic Manufacturing Methods and Supply Chain Challenges (Impact of non-industrial adjacent markets on adsorbent supply)
- IV. **Market Size, Growth and Key Trends by Adsorbent Application (by Process and Non-process Segments)**
 - Refining (Contaminants Removal, Off Gas Recovery)
 - Chemicals (Key Petrochemicals, EtOH)
 - Syngas (MeOH, NH₃ and Blue H₂)
 - Natural Gas (LNG, NGL, Fugitive Methane Control)
 - Industrial Gases (Future of Blue/Green/Multicolor H₂, Covid Impact on Medical Grade Oxygen, Cryogenic, PSA and VSA)
 - GHG/CO₂ Capture and Methane Capture (plus N₂O and O₃)
 - Other (Recycled Plastics/Pyrolysis Oil, BioGas, Polysilicon H₂ Off Gas Recovery)
- V. **Adsorbent Technical Developments**
 - Historical R&D Developments and Current Technical Trends
 - Scientific Literature and Patent Review/Analysis
 - Future Adsorbent Technology and New Applications for the Next 5-10 Years
 - Proposed R&D and Investment Direction
 - Beyond the Status Quo
- VI. **Commercial Strategy, Competitive Landscape and Barriers-to-Entry**
 - Evaluation of Competing Technologies and Their Role in Commercial Strategies
 - Changes in the Global Competitive Landscape
 - Challenges and Hurdles
 - Strategy for Implementation
- VII. **Conclusions and Recommendations**
 - Is this Still a Global Market?
 - What are the Technology Threats/Opportunities?
 - Where/What is the Bottom Line?

* Charter subscribers (those who sign up for the study prior to launch) will have the opportunity to work with TCGR to further refine the scope of the report by delineating areas of particular interest, notably in Sections III-V, for inclusion in the assessment.

V. QUALIFICATIONS

The Catalyst Group Resources, a member of The Catalyst Group, works with clients to develop sustainable competitive advantage in technology-driven industries such as chemicals, refining, petrochemicals, polymers, specialty/fine chemicals, biotechnology, pharmaceuticals, and environmental protection. We provide concrete proven solutions based on our understanding of how technology impacts business.

Using our in-depth knowledge of molecular structures, process systems, and commercial applications, we offer a unique combination of business solutions and technology skills through a range of client-focused services. Often working as a member of our clients' planning teams, we combine our knowledge of cutting-edge technology with commercial expertise to:

- Define the business and commercial impacts of leading-edge technologies
- Develop technology strategies that support business objectives.
- Assess technology options through strategy development, including:
 - Independent appraisals and valuations of technology/potential
 - Acquisition consulting, planning and due diligence
- Provide leading-edge financial methodology for shareholder value creation
- Lead and/or manage client-sponsored R&D programs targeted through our opportunity identification process.
- Provide leading information and knowledge through:
 - World-class seminars, conferences and courses
 - Timely technical publications

The client-confidential assignments conducted by The Catalyst Group include projects in:

- Reinventing R&D pipelines
- Technology alliances
- Technology acquisition
- Market strategy

We have built our consulting practice on long-term client relationships, dedication, and integrity. Our philosophy is clear and focused:

We Provide the "Catalysts" for Business Growth by Linking Technology and Leading-Edge Business Practices to Market Opportunities

VI. DELIVERABLES AND PRICING

This report is timely and strategically important to those industry participants and observers both monitoring and investing in the development and implementation of technologies for industrial adsorbents. TCGR’s report, based on technology evaluations, commercial/market assessments and interviews with key players will go beyond public domain information. As a result, subscribers are requested to complete and sign the “Order Form and Secrecy Agreement” on the following page.

The study, ***The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂*** will be completed within 3-4 months for “launch.” Subscription fees include delivery in both print (2 copies) and electronic (PDF via email) formats.

<u>“Charter” subscribers*</u>	<u>prior to launch</u>	\$22,500
<i>The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂</i>		
<u>Post-launch subscribers</u>	<u>after launch</u>	\$25,500
<i>The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂</i>		

** Charter subscribers (those who sign up for the study prior to launch) will have the opportunity to work with TCGR to further refine the scope of the report by delineating areas of particular interest, notably in Sections III-V, for inclusion in the assessment.*

Notice to Subscribers

*Due to the complementary nature of this study to TCGR’s multi-client reports completed in this area in 2019 and 2017 (“**THE SEPARATIONS REPORT: Commercial, Technical and R&D Assessment in Refining, Petrochemical/Syngas, Natural Gas and Industrial Gases**”), TCGR is offering a discount of \$1,000 off subscribers to either of those studies. Subscribers are requested to contact John J. Murphy at +1.215.628.4447 or jmurphy@catalystgrp.com if further details are required or to determine if your organization is entitled. When completing the order form, please make sure to indicate your company’s subscription to either/both of the earlier reports.*

ORDER FORM AND SECRECY AGREEMENT

The Catalyst Group Resources, Inc. Tel: +1.215.628.4447
 Gwynedd Office Park Fax: +1.215.628.2267
 P.O. Box 680 e-mail: tcgr@catalystgrp.com
 Spring House, PA 19477 - USA - website: www.catalystgrp.com

Please enter our order for “**The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂**” to be completed within 3-4 months of study launch, as follows:

_____ **The Industrial Adsorbents Business – 2022 Update: Commercial Strategy, Technical and R&D Assessment in Refining, Chemicals/Syngas, Natural Gas, Industrial Gases and GHG/CO₂** as a “charter” subscriber (i.e., prior to study launch) for \$22,500 (\$25,500 after study launch). Fees include report delivery in printed (2 copies) and electronic (PDF) formats.

_____ Please send us _____ additional printed copies @ \$250 each.

_____ * * * We are subscribers to the 2019 and/or the 2017 editions of **The Separations Report** and are therefore entitled to the \$1,000 discount off the subscription rate. * * *

In signing this order form, our company agrees to hold this report confidential and not make it available to subsidiaries unless a controlling interest (>50%) exists.

Signature: _____ Date: _____

Name: _____ Title: _____

Company: _____

Billing Address: _____

Shipping Address (no P.O. Boxes): _____

Express delivery services will not deliver to P.O. Boxes

City: _____ State/Country: _____

Zip/Postal Code: _____ Phone: _____

E-mail: _____ Fax: _____

This report and our study findings are sold for the exclusive use of the client companies and their employees only. No other use, duplication, or publication of this report or any part contained herein is permitted without the expressed written consent of The Catalyst Group Resources.