



Catalytic Advances Program

A Membership Program
offered by
The Catalyst Group Resources (TCGR)

2021

Program Overview...

Unique membership-driven commercial R&D consortium used to leverage research and innovation by sharing resources and experiences to address challenges

Designed to provide a technical update on commercially viable advances in catalysis, as well as benchmark commercial advances in catalysis and process technology

Interactive community which can be installed corporate wide/globally in order to benefit resourcing and collaboration, both externally and internally

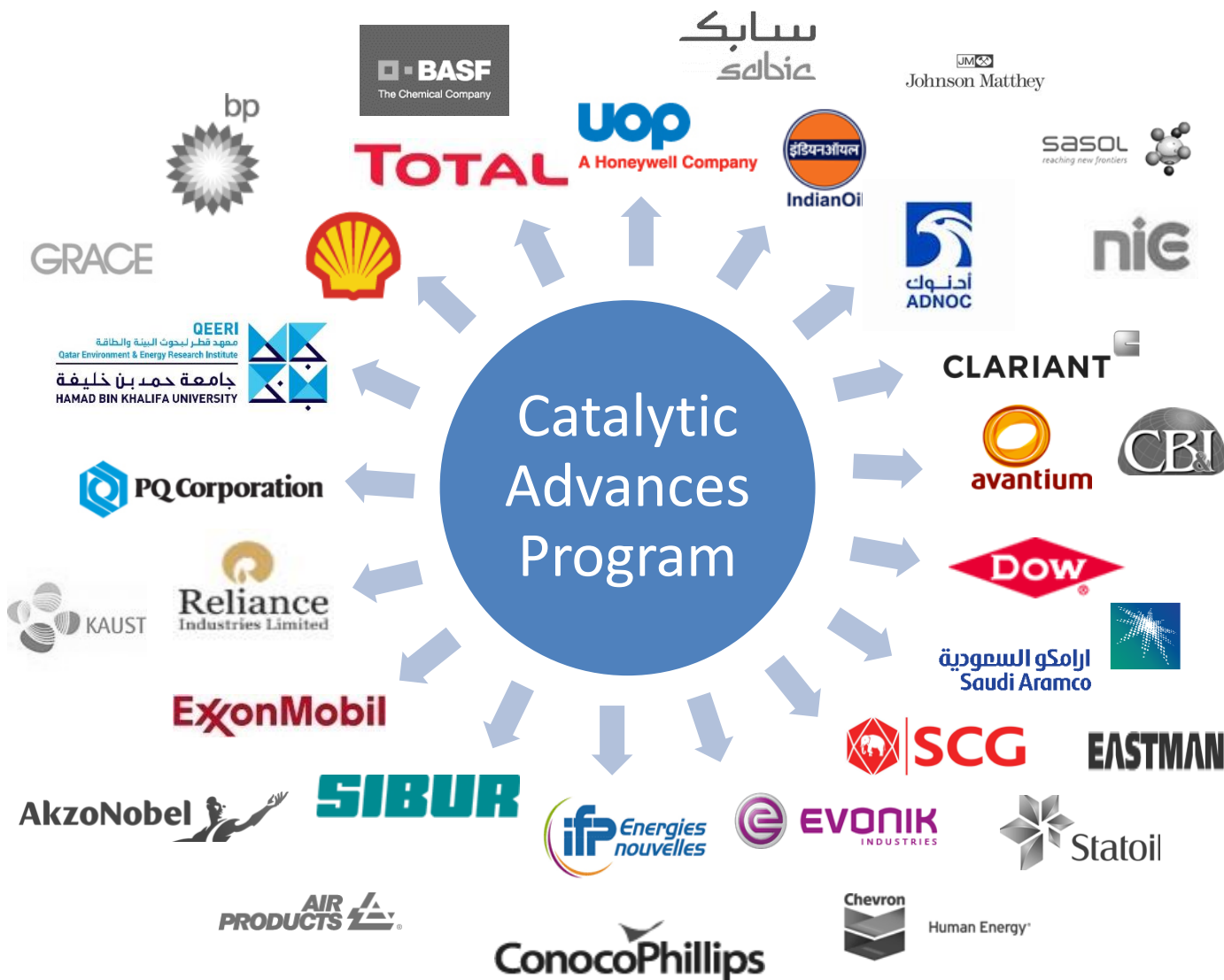
Delivering timely and insightful information and analyses, accessible exclusively to members and protected by confidentiality agreements, including peer-reviewed technical reports, email communications and an annual meeting

Focused R&D platform that provides the essential information and direction needed to optimize the returns from R&D investments

Resulting in a value-added relationship among members and with TCG/TCGR, leading to improved (or unique) external partnerships and/or investment opportunities

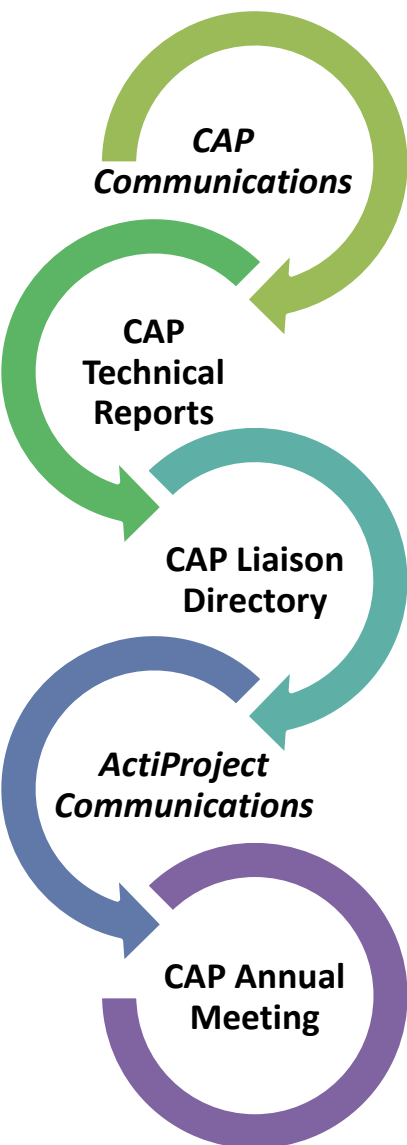
The Catalyst Group Resources (TCGR) is known for its visionary stance in the identification of novel technologies that lead to the development of new markets and industries. Clients who join our programs/studies benefit by being leaders in these new opportunities for their competitive advantage.

Companies Who Have Benefited from CAP...



CAP is unique and has proven to be of benefit to consortium members since 1995. The membership continues to expand and evolve, with more than a dozen industry leaders reflecting and increasing diversity of interests and pursuits.

Program Deliverables...



- **Stay informed with a timely and focused “window” into the market place of new developments in catalysis**
- Weekly emails capturing the latest global commercial and scientific catalysis developments are annotated with unique insights, observations and recommendations for competitive advantage.

- **Gain a competitive advantage through confidential “state-of-the art” studies in catalysis**
- Three (3) state-of-the-art reports are produced annually covering R&D and commercial development in catalysis. These exclusive reports are authored and peer reviewed by the world’s leading scientists. Topics are determined by the membership (via ballot) and report scope/content is shaped by member input.

- **Initiate joint R&D with another CAP member company**
- Contact information is supplied for the essential point-person at each CAP member company

- **Initiate a drill down study to find your unique opportunity**
- As needed, emails containing exclusive, members-only corporate opportunities are offered to share R&D and strategic partnerships for joint technical and/or commercial development in new technologies/businesses. Additionally, CAP members may also create their own *ActiProjects* to solicit to the membership.

- **Meet CAP members face-to-face to build camaraderie, discuss issues and initiate collaborative (JV/alliance) opportunities**
- An informal, collaborative (JV and alliance building) event is held once a year, exclusively for members, alongside one of the industry’s leading scientific platform conference(s).

Proven Benefits of CAP R&D Technical Reports...

Exclusive

- Three (3) state-of-the-art R&D technical reports are produced exclusively for members each year covering R&D and commercial development in catalysis.

Member Input

- Topics are determined by the membership (via ballots)
- Report scope/content is also shaped by member input (via TOC feedback)

Experts

- Authored by the world's leading scientists to include the relevant emerging technologies and also discuss the technical hurdles that must be overcome to achieve commercialization.

Quality

- Peer reviewed by experts from industry/academia and edited by TCGR to ensure high quality and standards

Recent Technical Report Topics Include...

- ***2020: Catalysts, Catalytic Processes, and Materials for Renewable Energy Production and Storage, Advances in Digitalization of Catalysis; How IR4.0 is Revolutionizing the Way we Go About Catalysis, and Novel Potential Catalysts for Oil to Chemicals Conversion***
- ***2019: Advances in Catalyst Supports II, Circularity in Chemicals, and Advances in Electrocatalysis and Photocatalysis for Chemicals Production***
- ***2018: Advances in Catalyst Synthesis and Characterization, Advances in Catalyst Modelling and Simulation, and Catalytic Conversion of Syngas to Chemical Products III***
- ***2017: Catalytic Process Scale-Up II, Advances in Octane Enhancement, and Advances in High Throughput Screening (HTS) Methodologies***
- ***2016: Advances in Olefin Co-monomer and Polyolefin Production, Advances in On-Purpose Technology for Mono- and Di-Olefins, and Recent Progress in Zeolitic Membranes for Gas Separations and Catalysis***
- ***2015: Advances in Aromatics Production, Advances in Methanol to Products, and Advances in Refinery Cracking Catalyst and Processes II***

State-of-the-Art CAP reports identify opportunities in catalysis, but they are also a valuable addition to HR as training materials. A full listing of the “library” of reports completed in CAP’s 25 years of operation is available upon request.

Study Topics Under Consideration for 2021 and Beyond ...

The following topics, plus those to be provided as “write-in” ideas by members, are under consideration as potential studies in 2021 (and beyond):

- *Catalysis for Specialty Chemicals, Intermediates and Agrochemicals*
- *Advances in Selective Oxidation*
- *Catalyst Deactivation, Regeneration and Disposal II*
- *Advances in Second Generation (2G) Drop-in Biofuels*
- *Advances in Non-Noble-Metal Based Catalysts for Reforming and Conversion of Hydrocarbons*
- *2D Materials in Catalysis*
- *Frontiers in Catalysts III: The Main Hurdles in Modern Catalysis*

Topics are determined by the membership (via ballot), exclusively for the membership.

Members Benefit from CAP Communications by Staying Informed and Prepared...

Global Developments

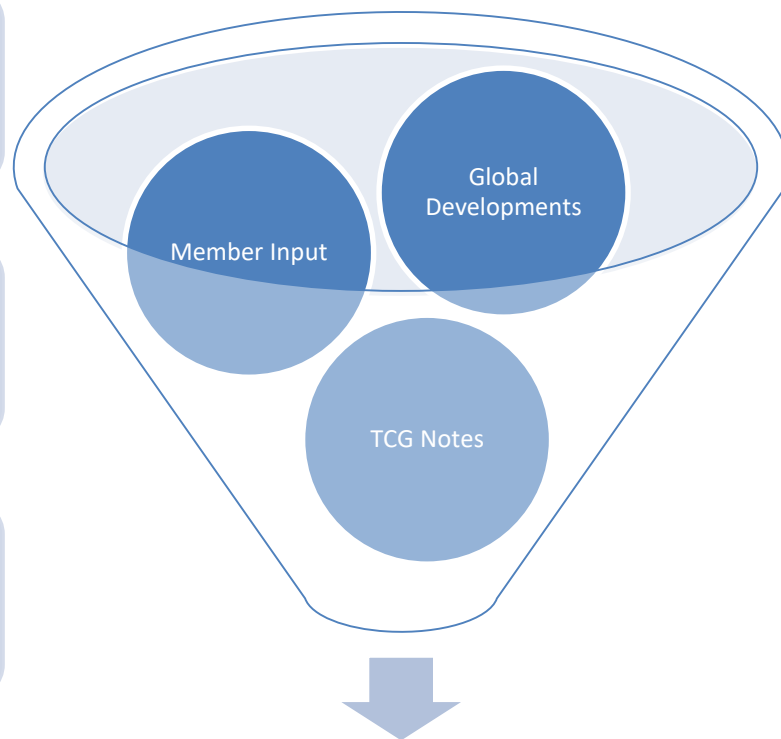
- Weekly email updates provide a timely and focused “window” into the market place of new developments in catalysis and process technology

Member Input

- Content is determined by member input from Quarterly Conference Calls, Annual Meetings, Report ballots, etc.

TCG Notes

- TCG provides insights, analyses and further commentary on selected developments of importance



CAP Communications

Topics Covered in CAP Communications...



Need/Justification...Getting Your R&D Gears in Motion

According to the IEA, ICCA, and DECHEMA “Technology Roadmap”, catalyst and related process improvements could reduce energy intensity of the 18 most energy intensive chemical products by 40% as a whole by 2050.

Just as it becomes increasingly difficult to push the envelope of technology development, R&D budgets are being constrained. Through CAP, members not only share a common interest in applied catalysis, members also benefit from shared R&D interests.

Combine resources with leading companies to jointly investigate the leading technologies in catalytic research

Identify the best routes for development

The growing development of international R&D centers shows that spreading R&D efforts is a sound growth initiative

There is an increasing diversity of approaches used in refining and chemical processing. Investing in the wrong approaches can be quite costly; investing too early (or too late) can be catastrophic.

With CAP, your sources of technical innovation and industry information are broader and deeper than ever.

Recent Examples of CAP's Benefits...Circle of Success



Program Options and Fees ...

- CAP is an annual consortium with two levels of participation in 2021:
 - Full Membership at \$34,000 per year;
 - Associate Membership at \$27,000 per year.
- Full membership entitles the subscriber to all three (3) technical reports produced each year. At the Associate level, the company selects two (2) of the three (3) technical reports produced each year. Participation in *ActiProjects* may require an additional fee.
- Once a company has committed to joining the program for two consecutive years (e.g., 2021-22), they may elect to exchange report selections in a given year for previously completed reports (i.e., those in the CAP “library”). The membership has included this 2-year requirement to avoid companies suspending their memberships without losing report privileges.
- Each member company signs a Corporate Membership Agreement, which fully documents the program content and operation.
- Examples of selected program deliverables (i.e., excerpts of completed reports, weekly *CAP Communication* emails, member ballots, actual report Tables of Contents, etc.) can be made available upon request. Additionally, testimonials from CAP members are also available.
- Note that at no time are member companies expected to contribute content (e.g., R&D results, technology development progress, etc.) for the reports or other program deliverables. The intellectual property of all member companies remains proprietary to them and program deliverables are based solely on TCGR enhanced publicly available information.



Additional Information and TCGR Contact Details...

The **Catalytic Advances Program** is available
on a membership basis from The Catalyst Group Resources (TCGR)

Further details can be obtained at:

http://www.catalystgrp.com/php/tcgr_catalyticadvancesprogram.php

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