Catalysts for change

Driving efficiency in petrochemicals

Petrochemicals: a global essential

Catalyst dependency

90%
chemical processes[1]

80%
of manufactured products globally[2]

Economic impact

20%
of U.S. commercial product value from catalyst-based processes[3]

Growing demand

30%
of oil demand growth by 2030[2, 4]

Widespread use: petrochemicals are essential for plastics, fertilisers and synthetic fibres

Sustainability and emission reduction

Pushing toward net-zero

Catalysts drive sustainability by enhancing efficiency, reducing emissions and enabling alternative feedstocks.

Heterogeneous catalysis in refining

Used in hydroprocessing (e.g., ultra-deep hydrodesulphurisation), which has reduced sulphur in diesel from 5000 ppm to <10 ppm since the 1990s.[7]

Fluid catalytic cracking (FCC)

Zeolite catalysts convert heavy oil to gasoline, meeting 2045 demand while reducing waste and crude extraction, cutting environmental impact.[7, 9]

Innovative ionic liquid catalysts

Developed by Chevron and Honeywell in 2021, these catalysts extend catalyst life and reduce costs, enhancing efficiency in high-octane gasoline production.[10]

Sustainable catalysts in oxidation and dehydrogenation

Used to produce essentials like plastics, fibres, and rubber, crucial for meeting demand sustainably with a projected $750 billion market by 2028.[11]

Biodiesel via hydrogenation

Vegetable oil catalysts produce biodiesel, cutting emissions and fossil fuel use. With 2032 output at 60 billion liters, it meets rising sustainable fuel demand.[12]

CO_2 sequestration and CCUS

Catalysts in CCUS convert CO_2 into valuable products like methanol and synthetic fuels, creating a closed carbon loop that cuts greenhouse gases and boosts economic value.[13]

Syngas production

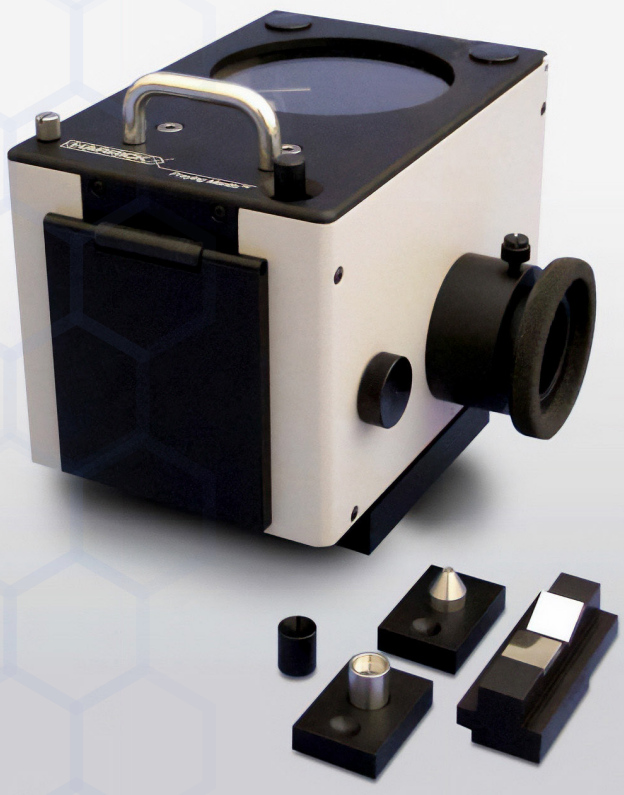
Advanced catalysts turn natural gas and biomass into key ingredients for fuels and chemicals, offering a cleaner, efficient alternative to traditional hydrocarbons.[14]

Selective catalytic reduction (SCR)

Using catalysts, this technology cuts nitrogen oxide (NO_X) emissions by up to 90%, improving air quality in power plants and diesel engines while meeting strict standards.[15]

Tools and techniques

The Praying Mantis™: setting standards in spectroscopy



Performance excellence

The Praying Mantis™ delivers pure data even for complex powdered catalytic samples due to the 90° off-axis optical design. This design efficiently collects diffusely reflecting light while minimising the specular reflection.

Versatile operations

Handles extreme conditions (from -150°C to 910°C and up to 34 Bar of pressure), suitable for diverse petrochemical applications.

Templink GUI

Simplifies the setup of temperature profiles linked with data acquisition. Supports unattended operation by enabling data gathering at selected temperature setpoints. Seamlessly integrates the Harrick Temperature Controller and temperature-controlled accessories. Available for select spectrometer models-contact us for details.

Cost and efficiency gains

Reduces redundant testing, improving R&D productivity.

View online

Contact us now to book a consultation with one of our scientists and discover how the Praying Mantis™ can drive breakthroughs in petrochemical R&D and support global sustainability initiatives.

Specac
HARRICK
a Specac company

Specac, a leading provider of spectroscopic equipment for industries such as pharmaceuticals and petrochemicals, now offers the Harrick Scientific Praying Mantis™ accessory, delivering high-quality data for demanding petrochemical R&D applications.

References

1 Thermo Fisher Scientific. Praying Mantis and Catalyst Performance. **2** Euro Petroleum Consultants. FTIR and Catalyst Impact Reports. **3** In-situ Characterization of Heterogeneous Catalysts (2013). John Wiley & Sons. pp. 1-23. DOI:10.1002/9781118355923 **4** IEA (2023). World Energy Outlook 2023 **5** Workman, J. Jr (2024) Spectroscopy Innovations in Petrochemicals. Spectroscopy Online 6 Petro Online. https://www.petro-online.com **7** Dembaremba T. et al (2022) CO2 Utilization Using Heterogeneous Catalysts. Front. Chem. DOI:10.3389/fchem.2022.807225 **8** IEA (2024). Global Gas Demand Growth Despite Geopolitical Uncertainty 9 Statista. Global Oil Products Demand Outlook 2045 **10** Chevron. Start-up of World's First Commercial ISOALKY™ Ionic Liquids Alkylation Unit. **11** Gautam, B.P.S., Qureshi, A., Gwasikoti, A., Kumar, V., Gondwal, M. (2024). Global Scenario of Plastic Production, Consumption, and Waste Generation and Their Impacts on Environment and Human Health. In: Soni, R., Debbarma, P., Suyal, D.C., Goel, R. (eds) Advanced Strategies for Biodegradation of Plastic Polymers. Springer, Cham. DOI:10.1007/978-3-031-55661-6_1 **12** OECD-FAO Agricultural Outlook 2023-2032 | OECD Biodiesel Projections: Production and Use. **13** Waclawek, S., Padil, V. and Cernik, M. (2018) Major Advances and Challenges in Heterogeneous Catalysis for Environmental Applications: A Review Sciendo DOI:10.1515/eces-2018-0001 **14** Glotov, A, Karakhanov, E (2021) Heterogeneous Catalysts for Petrochemical Synthesis and Oil Refining Catalysts; Basel Vol. 11, Iss. 5, 602. DOI:10.3390/catal11050602 **15** USA Environmental Protection Agency