



PQ Corporation

SILICA CATALYSTS



OFFERING A WIDE VARIETY OF HIGH-PERFORMANCE SILICA CATALYSTS & SUPPORTS

PQ Corporation works closely with our clients to develop and manufacture customized catalysts that will meet their specific performance goals. We provide a wide range of silica gel catalysts and supports for polyolefin production and chemical synthesis. Our state-of-the-art manufacturing processes give us the flexibility to tailor catalyst properties, including surface area, pore volume, and metal content, to meet the specific needs of our customers.

PQ has been producing silica catalysts since 1976. We operate plants in Rahway, NJ, Kansas City, KS, and Warrington, UK. All of our plants are ISO 9001 certified, ISO/RC14001 compliant and utilize statistical process control methods to reduce variation.

PQ silica supports are used in the production of chrome, Ziegler-Natta, single-site, and specialty cata-

lysts that find application in manufacture of high-density polyethylene (HDPE), linear low-density polyethylene (LLDPE), polypropylene, and other polymers. These polymers are used to great advantage in a wide variety of applications including films, blow-molded products, wire and cable sheathings, and pipes. Our supports and catalysts are used in both gas-phase and slurry-phase processes.

PQ is a key global supplier of chrome-on-silica catalysts. By exercising careful control of critical process variables, we are able to produce highly uniform products with tightly controlled surface areas and pore volumes. The combination of surface area and pore volume defines another critical parameter, average pore diameter, according to the following relationship:

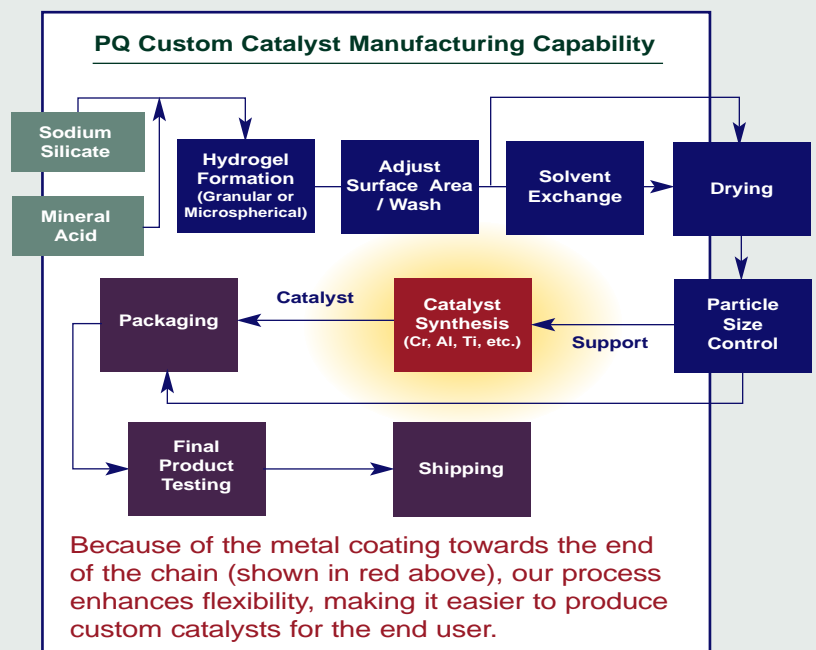
$$APD (\text{\AA}) = \frac{40,000 \times PV (mL/g)}{SA (m^2/g)}$$



Catalysts Group business office and R&D Center, Conshohocken, Pennsylvania, USA.



Research and Technology Centre, Warrington, UK.



MORPHOLOGY

- Granular
- MS gel
- ES gel
- Large bead

SYNTHESIS APPROACH

- Co-gelation
- Encapsulation
- Composite
- Surface reaction

PQ's state-of-the-art process technology and control...



enables us to customize catalysts to meet your exact needs.

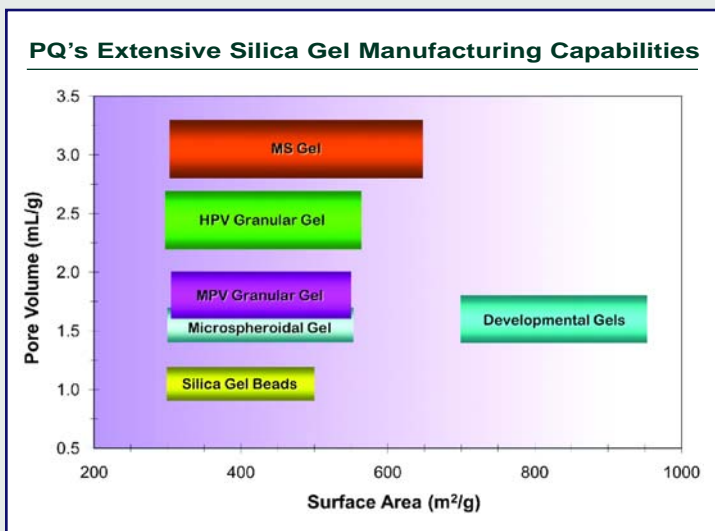
SUPPORT PROPERTIES

- Chemistry
- Surface area
- Pore volume
- Particle size distribution

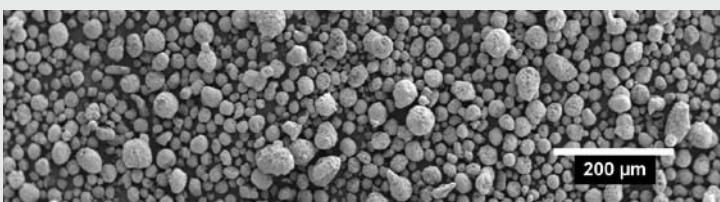
APPLICATION

- Chrome on silica
- Ziegler-Natta
- Single site
- Chemical synthesis

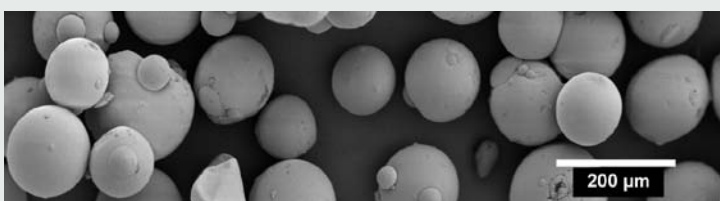
DELIVERING HIGHLY CONSISTENT PRODUCTS AND UNSURPASSED TECHNICAL SUPPORT



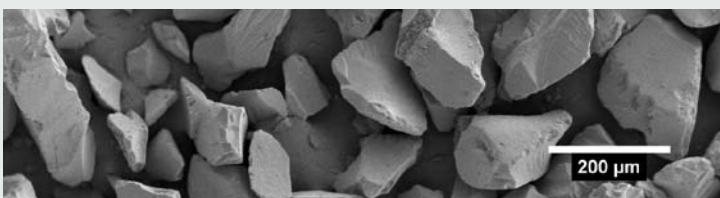
In the production of HDPE, surface area, pore volume, and pore diameter of the silica support strongly influence polymerization characteristics (e.g. activity) and final polymer properties (e.g. melt index and environmental stress crack resistance). Control of particle size distribution is also extremely important since the growing polymer replicates the shape and size distribution of the silica catalyst particles. PQ silica supports are manufactured with narrow particle size distributions, leading to low fines and good flowability. In addition to our granular gel process, we also operate microspherical gel processes producing both spray-dried and continuous-



PQ microspherical ES-type silica support

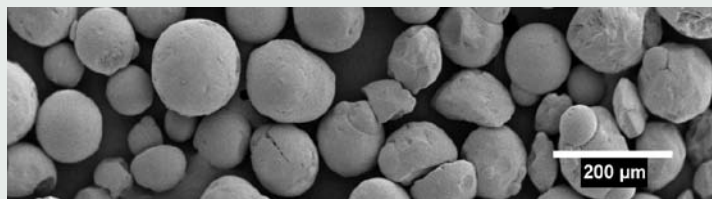


PQ microspherical MS-type silica support

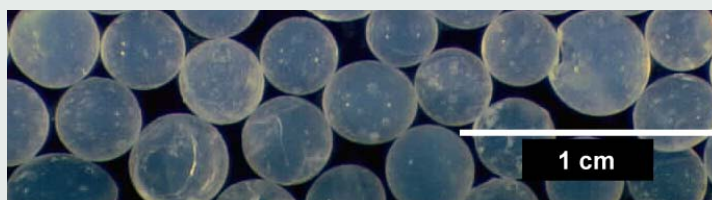


PQ granular Cr-Ti silica catalyst

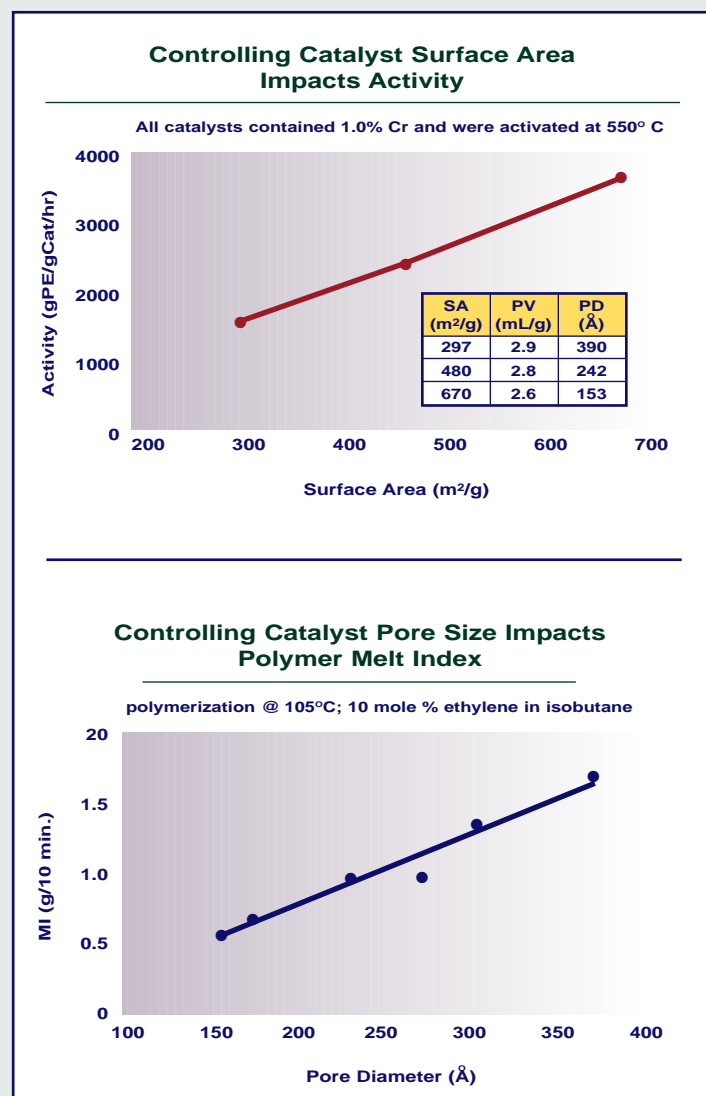
phase beads. Utilizing our broad capabilities, PQ can produce particles from 20 µm to 5 mm for use in a wide range of catalyst applications.



PQ microspherical MS-type Cr-Al silica catalyst



PQ AlphaCat™ silica bead catalyst



Through careful control of raw materials and attention to process parameters, PQ silica catalyst supports have low levels of critical impurities. In fact, PQ is the world leader in the production of sodium silicate, a key raw material in the production of silica catalyst supports, so we can directly manage the quality of this criti-



PQ's silica catalyst plants utilize state-of-the-art manufacturing processes.

cal feedstock. Low sodium content gives our products high thermal stability, which is important to prevent surface area loss during catalyst activation.

In addition to chrome-on-silica, we also offer modified chromium catalysts containing aluminum or titanium to provide performance enhancements needed for certain end uses, such as reduced induction time and increased activity, MI, and ESCR.

In addition to our HDPE catalysts, PQ is a manufacturer of custom catalysts for chemical synthesis. We are interested in working with you to develop customized silica-supported catalysts for your chemical process.

Expert technical service is provided by the experienced team at our R&D Centers in Conshohocken, PA, USA and Warrington, UK. Using our bench-scale slurry poly-

merization reactors, we work in close collaboration with our customers to develop custom catalysts.

We are well equipped to measure all critical silica properties, including surface area/pore volume (N₂ and Hg porosimeters); particle size, shape, and structure (laser diffractometers, scanning electron microscope); strength (various methods); elemental composition (AA, ICP, XRF, EDS); and thermal and structural properties (IR, UV-visible, Raman, TGA, DTR, DSC, etc.). In addition, we are also well equipped to measure key polymer properties, including rheology (melt indexer, rheometers), density, wax, and ESCR.

PQ is well known in the polyolefin industry for its excellent customer service both before and after the sale. We strive to establish long-term, mutually beneficial relationships with our customers that lead to more rapid product development and problem solving at lower cost.



Extensive testing capabilities include this bench-scale polymerization reactor at R&D.



A wide range of analytical capabilities include this XRF spectrometer at our Kansas City plant.



On 2nd July 2008 INEOS Silicas Ltd merged with PQ Corporation. Both PQ, which was founded more than 175 years ago, and INEOS, whose roots go back to 1815, have long traditions of producing high quality products and providing top-flight service for our customers.

In 1815 at Warrington, England, Joseph Crosfield established a soapery that benefited from the many advantages of its location. These included local raw materials such as salt from Cheshire and coal from St. Helens, as well as the River Mersey, along which imported materials were brought from Liverpool.

PQ Corporation traces its beginnings to a family soap and candle business opened in Philadelphia by Joseph Elkinton in 1831. The original company began producing and selling "silicate of soda" (sodium silicate) in 1861 as a builder to replace rosin in soap formulations.

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About PQ Corporation

PQ Corporation (www.pqcorp.com) is a leading producer of specialty inorganic chemicals, catalysts, and engineered glass products, with annual sales revenues in excess of US \$1 billion. The company conducts operations through three principal businesses: the Performance Chemicals division, which develops, manufactures and sells high performance silicate-based specialty chemicals; the Catalysts division, a leading producer of high performance zeolite- and silica-based catalysts; and the Potters division, which manufactures and sells highly engineered solid and hollow glass spheres. The company's products are used in a variety of applications in a diverse range of industrial, consumer and governmental end-markets. The company operates over 60 manufacturing sites in 21 countries on five continents and has one of the most comprehensive global manufacturing and distribution networks serving customers in the company's end-markets.



Rahway, New Jersey, USA plant



Kansas City, Kansas, USA plant

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