

# Catalyst Substrate Spheres (CSS)

Smooth spheres of activated alumina

## Product information

Engelhard catalyst substrate spheres (CSS) are smooth spheres of activated alumina produced by Engelhard's unique manufacturing processes. Engelhard catalyst substrate spheres have seven special properties, which comprehensively are not normally found in other catalyst substrate spheres: (1) uniform size, (2) low abrasion loss, (3) smooth surface, (4) high crush strength, (5) low water breakage, (6) controlled surface area, and (7) controlled pore volume. Engelhard catalyst substrate spheres are designed especially for catalyst and petrochemical customers who manufacture finished catalysts.

### Applications

1. **Uniform size.** Engelhard catalyst substrate spheres are uniformly sized spheres. The uniform size yields a low pressure drop. High pressure drop results in less throughput and higher operating costs. More importantly, the uniform size minimizes channeling yield a uniform reaction throughout the entire system.
2. **Low abrasion loss.** The low abrasion loss of Engelhard catalyst substrate spheres ensure that metals impregnated on the catalyst stay on the catalyst.

3. **Smooth surface.** Engelhard catalyst substrate spheres' smooth surface allows optimum flow through a reactor bed. Optimum flow ensures that uniform temperatures are achieved yielding better selectivity and conversions.
4. **High crush strength.** Engelhard catalyst substrate spheres' high crush strength is especially important during the impregnation and subsequent calcination step in catalyst formulation. Since most impregnating solutions are acidic and activated aluminas are very soluble at a pH less than four, the spheres are susceptible to attack by the solution. Upon subsequent calcination, fine can be generated. Engelhard catalyst substrate spheres all have exceptionally high crush strength to minimize this problem.
5. **Low water breakage.** Catalyst substrate spheres evolve high heats of wetting when immersed in impregnating solutions. As the solution fills pores and displaces air, bubbles are emitted. The escaping gas pressure can be so high that some of the spheres break. Each lot of Engelhard catalyst substrate spheres are carefully analyzed to ensure low water breakage.

6. **Controlled surface area.** Two distinct types of Engelhard catalyst substrate spheres are available:

- *High surface area:* BET surface area is as high as possible to maximize surface activity.
- *Intermediate surface area:* Surface area is reduced via calcination to 165 m<sup>2</sup>/g to shift pore volume distribution, converting micropores to mesopores.

Customers desiring lower surface areas should consider Engelhard's SAS premium support spheres.

7. **Controlled pore volume.** Total pore volume is controlled to nominal 0.5 cc/g in above products. With relatively high macropore and total pore volumes, Engelhard catalyst substrate spheres are ideal for use as a catalyst substrate. Impregnation with metals and similar active agents, via spray or solution processes, results in a finished catalyst with superior physical properties.

### Available packaging

- 2000 lb super sacks
- DD-443 and DD-447 also available in 300 lb steel drums

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## About Engelhard

Engelhard is a surface and materials science company that develops technologies to improve customers' products and processes. A Fortune® 500 company, Engelhard is a world-leading provider of technologies for environmental process, appearance and performance applications.

For more information about Engelhard catalyst substrate spheres, simply call us at 318-336-9601, or visit us at [www.engelhard.com](http://www.engelhard.com).

Chemical composition (wt %)	DD-443	DD-447	CSS-350
Al <sub>2</sub> O <sub>3</sub> *	99.6	99.6	99.6
SiO <sub>2</sub>	0.02	0.02	0.02
Na <sub>2</sub> O	0.35	0.35	0.35
LOI (2250-1000°)	4.0	2.0	5.0

  

Physical properties			
Surface area, m <sup>2</sup> / g	350	165	350
Pore volume, cc/g	0.55	0.55	0.55
Abrasion loss, wt %	0.25	0.5	0.1
Bulk density, lbs / ft <sup>3</sup>	44	43	46
Attrition, wt %	1.0	1.5	1.0
Macroporosity, cc / g	0.12	0.13	0.10
Crush strength (4x6 mesh, 4mm), lbs	30	28	35

\*calcined basis

All data represents typical product properties and are based upon Engelhard standard test methods. All test methods are available upon request. Information presented herein is believed to be accurate and reliable but does not imply any guarantee or warranty by Engelhard.

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### Customer Service

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