

## Hydrogenation Catalyst for Toluene/MCH LOHC Process

### APPLICATION

The toluene/methylcyclohexane (MCH) liquid hydrogen carrier process is an innovative and efficient method for storing and transporting hydrogen. This process utilizes the reversible chemical transformation between toluene and methylcyclohexane to safely and effectively store hydrogen in liquid form, making it ideal for long-distance transport and various end-use applications.

Under high-pressure hydrogen and in the presence of Delion's hydrogenation catalyst, toluene reacts with hydrogen to form methylcyclohexane (MCH). MCH serves as a hydrogen-rich liquid carrier, storing hydrogen in a chemically bound form. It is then transported to the end-use site, where it is converted back into toluene and hydrogen is released at elevated temperatures in the presence of Delion's dehydrogenation catalyst.

### DESCRIPTION

DELION's hydrogenation catalyst can be used in batch, fixed-bed, or continuous-flow reaction processes and utilizes a proprietary alumina support. The catalyst demonstrates high activity, enabling the efficient hydrogenation of toluene into methylcyclohexane at moderate temperatures and pressures. DELION's palladium, supported on alumina, is a highly effective catalyst due to its excellent hydrogenation activity and thermal stability. The reaction can be performed under solvent-free conditions, but inert solvents may also be used to improve heat transfer. In case of deactivation, regeneration through calcination in air or hydrogen stripping treatment can restore the catalyst's performance. A typical run duration is several months. By optimizing reaction conditions and ensuring feed purity, Pd/Al<sub>2</sub>O<sub>3</sub> can achieve high yields of methylcyclohexane with exceptional efficiency and durability.

### PHYSICAL & CHEMICAL PROPERTIES

Parameter	Unit	Specification
Form	-	sphere
Color	-	gray-black
Mean diameter	mm	2.2
Bulk Density	g/ml	0.65±0.05
Crushing Strength	N/cm	>40
Al <sub>2</sub> O <sub>3</sub>	%	>99.5
Active component		Pd

### PROCESS CONDITIONS & PERFORMANCE

Element	Unit	Specification
Pressure	MPa	2.0-4.0
Temperature	°C	150-25
WHSV	kg <sub>feed</sub> /kg <sub>catalyst</sub> ×h	0.5-2.0
Catalyst life	years	>2