

# Silicon Trap – CatGuard® Si21

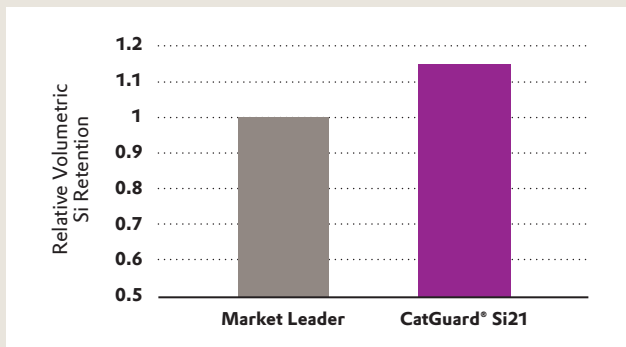
## CatGuard® Catalyst Protection You Can Count On

### Description

Silicon contamination is a major concern for coker naphtha but small quantities can be found in the kerosene and diesel fractions too. In addition to silicon contamination, fouling by polymerization can occur, when coker naphtha is processed.

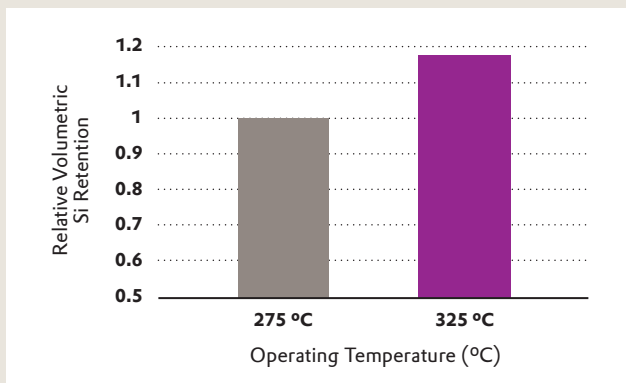
**CatGuard Si21** provides enhanced protection above the main catalyst bed by trapping silicon before it damages the catalyst's active sites. This protection will result in longer run lengths and lower catalyst costs.

The following canister results, from NHT services in North America, demonstrates that **CatGuard Si21** outperforms a market leader silicon trap.



Silicon condensation is also dependent on the operating temperature as per the below graph:

### CatGuard® Si21



### Benefits

In order to optimize the HDN/HDS activity and to maximize the cycle length of the main bed catalyst, **CatGuard Si21** has been specially designed to:

- Gently saturate the olefins and mitigate delta pressure build-up (mild hydrogenation activity)
- Trap silicon due to its high surface area (maximum silicon pick-up capacity)
- Maximize volumetric retention
- Minimize diffusional limitations (optimized pore size structure)

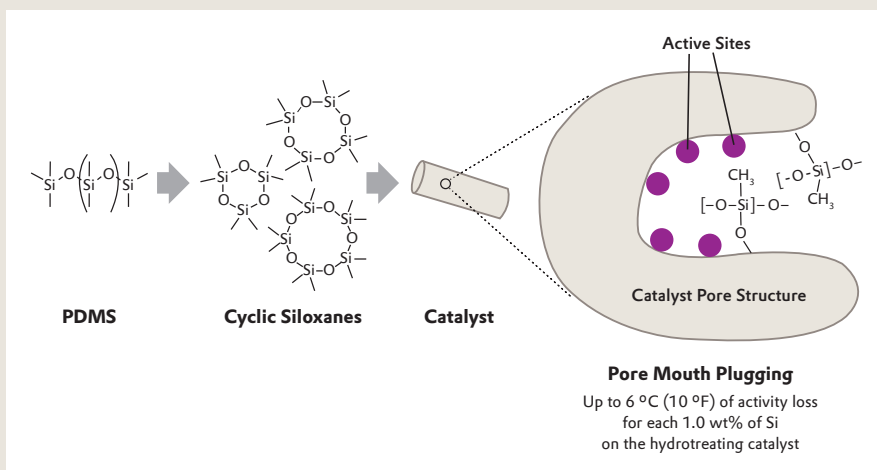
### Main Sources

Silicon is the widespread contaminant for hydrotreating units. The main sources are:

- Use of anti-foaming agents in delayed coker operations. Up to 80% of silicon ends up in the coker naphtha fraction (Si content, up to 10 ppmw)
- Process of synthetic crudes involving a coking step
- Use of silicon additives, as anti-foaming agents, in the drilling process
- Use of silicon additives in barge unloading to improve flow performance

## Deactivation Mechanism

Silicones are mainly used as antifoaming agents in delayed cokers, such as polydimethylsiloxane (PDMS), which are thermally decomposed as cyclic siloxanes. These by-products are adsorbed onto the catalyst surface, followed by decomposition into simple silica gels containing  $\text{SiO}_2$ ,  $\text{SiOH}$ ,  $\text{Si(OH)}_2$  and silica gels associated with methylated surface species. As the silicon builds up on the catalyst, it begins to plug the catalyst pore and block the access to the active sites (pore mouth plugging) affecting the catalyst performance.



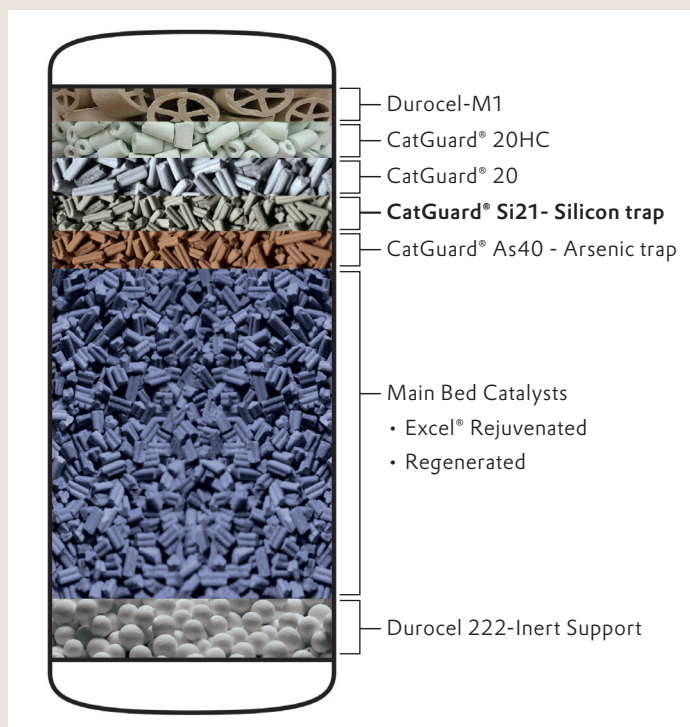
## Complete Hydroprocessing Solutions

**CatGuard Si21 silicon trap** is a key part of Evonik's comprehensive hydroprocessing product line. Evonik's technology portfolio enables refiners to meet their product quality and cycle length targets in hydroprocessing applications for a fraction of the cost of conventional catalysts.

- Maximize unit performance
- Protect against poisoning
- Increase life cycle length

Evonik offers extensive technical support, from catalyst modeling performance to unit startup and monitoring.

Evonik has an extensive inventory of grading materials, metal traps, and catalysts stored globally at our plants in the United States, Canada, Luxembourg, and Singapore.



### Disclaimer

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### EVONIK OPERATIONS GMBH Business Line Catalysts

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