



# MATHESON

## Nanochem® GuardBed™

Manufactured for Nippon Sanso Matheson by  SulfaTrap™

Nippon Sanso Matheson is a leading supplier of deep desulfurization products and contaminant removal systems (e.g., metals, halides). The **Nanochem® GuardBed™** proprietary sorbents eliminate all sulfur contaminants ranging from simple sulfides to complex thiophenes from a range of process streams. MATHESON can provide our customers with bulk media and/or fully customized turn-key purification solutions for nearly all desulfurization applications.



Nanochem® GuardBed™	Sulfur Removal														Metals Removal	
	R2B	R2F	R4	R5C	R5E	R5P	R6	R7E	R7F	R8	D1	D4	WG	HRG	MT1	MT2
<b>Natural Gas</b>																
Pipeline Quality Gas Ultra Purification	•	•	•				•			•						
Bulk Processing					•		•	•	•							
High Moisture Gas	•	•	•	•				•	•							
High COS Gas								•	•							
LNG	•	•	•		•		•	•	•	•						
Metals Removal															•	•
<b>LPG</b>																
HD5, HD10			•		•		•			•						
High COS LPG					•	•										
Metals Removal															•	•
<b>Gaseous Feedstocks</b>																
Olefins (ethylene, iso-butene)	•	•														
Bulk Gas Ultra Purification (H <sub>2</sub> , CO <sub>2</sub> )		•	•	•		•				•						
Refinery Offgas	•	•		•						•						
Synthesis Gas/Reformate													•	•		
Metals Removal															•	•
<b>Liquid Feeds</b>																
Natural Gas Liquids	•	•														
Chemical Feeds (NH <sub>3</sub> , diethylether)	•	•	•													
Gasoline & Diesel Upgrade											•	•			•	•
<b>Renewables</b>																
Bio-Ethanol	•	•									•	•				
Bio-Diesel									•	•	•					
Biogas	•	•						•	•	•						

**Nanochem® GuardBed™-R2** products are universal sulfur adsorbents used in ultra-purification of a range of hydrocarbons and chemical feedstocks. They can remove a wide range of sulfur compounds (including sulfides, mercaptans and thiophenes) reducing the total sulfur concentration of the gas to single digit ppbv concentrations. **Nanochem® GuardBed™-R2** sorbents are tolerant to moisture (up to 10,000 ppmv H<sub>2</sub>O) and heavy hydrocarbons, making them highly suitable purifiers for complex feedstocks (e.g., ethylene, propylene) and off-gases (e.g., refinery off-gases, natural gas tainted with LPG during peakshaving).

**Nanochem® GuardBed™-R2B** sorbent offers regenerable service for extended product life. In bulk processing applications (such as in large LNG plants), **Nanochem® GuardBed™-R2B** purifiers located downstream of amine scrubbers can remove the mercaptans and complex sulfides to meet the purity requirements. The regenerable operation ensures cost-effective gas processing. The **Nanochem® GuardBed™-R2B** sorbent also eliminates sulfur from natural gas liquids and other light hydrocarbon condensates.

**Nanochem® GuardBed™-R4/R6** adsorbents are recommended for ultra-purification applications. These are designed for purifying lower moisture natural gas (e.g., pipeline quality). The **Nanochem® GuardBed™-R4** and **Nanochem® GuardBed™-R6** sorbents tolerate up to 500 and 1,000 ppmv H<sub>2</sub>O, respectively (3 to 6 times higher than pipeline specification of 154 ppmv – 7 lb/MMACF). These sorbents are particularly effective in removing dimethyl sulfide and methyl ethyl sulfide, which have proven to be extremely difficult to remove using common adsorbents.

**Nanochem® GuardBed™-R5** sorbents are highly effective for carbonyl sulfide (COS) removal. These are recommended for ultra-purification of natural gas, LPG streams and natural gas liquids. **Nanochem® GuardBed™-R5C** is designed to handle high moisture gas, while **Nanochem® GuardBed™-R5P** is recommended for LPG desulfurization. **Nanochem® GuardBed™-R5C** is also shown to be highly effective in ultra-purification of carbon dioxide (CO<sub>2</sub>).

**Nanochem® GuardBed™-R7E/R7F** sorbents are high capacity and low-cost bulk sulfur removal sorbents. These are particularly effective for hydrogen sulfide (H<sub>2</sub>S) and low molecular weight mercaptan removal (e.g., methyl mercaptan, ethyl mercaptan). They could achieve 30-35% wt. sulfur capacity (kg sulfur removed per kg sorbent). **Nanochem® GuardBed™-R7F** sorbent is effective for completely dry gas or under fully saturated conditions **Nanochem® GuardBed™-R7E** is the lower cost option and maintains its performance in moist gas (500 ppmv H<sub>2</sub>O to saturation) making it ideal for biogas purification.

**Nanochem® GuardBed™-R8** sorbent can be used for deep purification of natural gas or biogas. Its large pore size makes it ideal for removing large sulfur molecules, such as disulfides (e.g., methyl ethyl disulfide, diethyl disulfide), large mercaptans (e.g., tert-butyl mercaptan) and thiophenes (e.g., methyl thiophene). A modified version of it is also effective for removal of siloxanes from biogas.

**Nanochem® GuardBed™-D1/D4** sorbents treat liquid hydrocarbons, including natural gas liquids, bio-ethanol, gasoline and diesel fuel. These can be operated in a regenerable manner (regeneration is carried out by mild thermal swing). It could be used in stand-alone sulfur removal systems or can be integrated to traditional hydro-desulfurization systems (HDS), polishing off any unconverted sulfur from streams feeding into the gasoline pool.

**Nanochem® GuardBed™-WG/HRG** remove H<sub>2</sub>S and COS at elevated temperatures (250°C to 800°C, respectively). These are primarily designed to treat synthesis gas or reformat gas, reducing sulfur level to single digit ppbv concentrations.

**Nanochem® GuardBed™-MT** sorbents remove heavy metals (such as mercury, arsenic and selenium) from a range of process streams. **Nanochem® GuardBed™-MT1** achieves over 20% wt mercury capacity (kg mercury removed per kg of sorbent), while **Nanochem® GuardBed™-MT2** removes mercury along with other volatile metals such as arsenic from natural gas and other hydrocarbon streams.

**Most products available in the form of 1/16” or 1/8” extrudates and custom pellet sizes.**