

TBPS 454

Di-tert-butyl-Polysulfide

CAS No: 68937-96-2

Refinery Applications

TBPS 454 is a sulfiding agent which is used, along with a reducing agent such as hydrogen, to transform metal oxide species to a metallic sulfide crystalline phase *in situ* for hydrotreating catalysts. For *in situ* sulfiding the reaction is performed inside the process unit for complete control and to achieve maximum catalyst activity and safe handling.

Packaging

TBPS 454 is available in bulk (tank trucks and ISO containers) or packaged containers including 250 gallon plastic totes and 54 gallon drums.

Advantages

Unlike other sulfiding agents, TBPS 454 is not classified as a flammable material. It also has a low toxicity rating. TBPS 454 has a diesel like odor, a more friendly and common smell for refineries. TBPS 454 also starts to convert to H₂S at the lowest temperature compared to other sulfiding agents, lowering the risk of reduction of metals and potentially lessening the time of the sulfiding operation. The hydrocarbon byproduct during a sulfiding operation for TBPS454 is isobutane, which does not have the potential to dilute hydrogen in the recycle gas during a sulfiding operation.

Safety and Handling

TBPS 454 is an environmentally hazardous substance and a marine pollutant. It also has a high viscosity rating, making it difficult to handle during cold weather. It is not soluble with water but is soluble in hexane and white spirits. TBPS is

compatible with both carbon and stainless steel. Teflon or Viton gaskets are recommended for the injection of TBPS 454. There are no known incompatible materials. Household bleach (not pure bleach) or Liquid Alive® bacteria is suggested for any needed clean up. Please reference the MSDS for additional handling and safety recommendations.

Sulfiding Agent Properties

Characteristics	DMDS	TBPS454	DMS
Sulfur % (wt)	68	54	52
Density (lbs/gal)	8.9	9.0	7.11
Freezing Point (°F)	-121	-54	-145
Boiling Point (°F)	229	N/A	99
Flash Point (°F)	59	217	-36
Vapor Pressure at 70°F (PSI)	.45	<.1	8.1
Decomposition Temperature* (°F)	392	320	482
Auto Ignition Temperature (°F)	575	437	403
Viscosity at 70°F (mPa.s)	.62	12.8	.285

Product Safety Information

Material Safety Data Sheets are available upon request and on our website:

www.cpchem.com/specialtychemicals



*In the presence of H₂ and Catalysts

TBPS 454 Cont'd

Application Guidelines

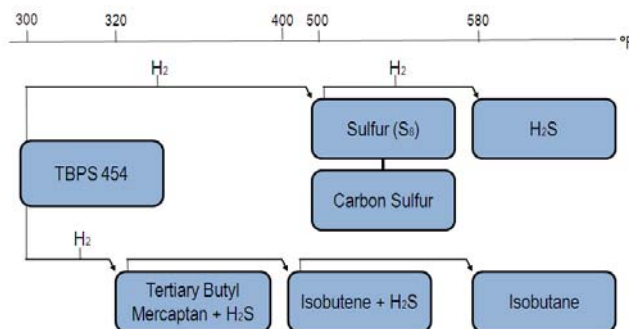
For *in situ* sulfiding of hydrotreating catalysts, the catalysts will typically be dried and then wetted with feed material at 300°F or below. TBPS 454 injection begins as the temperature approaches 400°F, with the reactor held in a range of 400–420°F until H₂S breakthrough occurs. Breakthrough is indicated when the H₂S level of the recycle gas exceeds 5000 ppm. The reactor temperature can then be raised to the secondary sulfiding plateau, which is typically in the range of 620–670°F. The temperature will be held at this level for at least 4 hours until the sulfiding process is complete. A secondary H₂S breakthrough may occur at this point, with H₂S levels rapidly exceeding 20,000 ppm (see Figure 2).

TBPS 454 decomposition can form elemental sulfur. Elemental sulfur with the combination of olefins can create a solid polymeric product. This risk increases with an excess of TBPS 454 injected during a sulfiding operation at temperatures below 500°F. The injection point needs to be as close as possible to the catalyst bed to avoid potential deposits in the preheating section which can leave solid deposits in the piping and on the catalyst. Gas phase sulfiding is not possible in order to avoid any solid formation. TBPS 454 also breaks down to Tertiary Butyl Mercaptan, a high odor chemical. (See Figure 1)

Comparison of Other Polysulfides

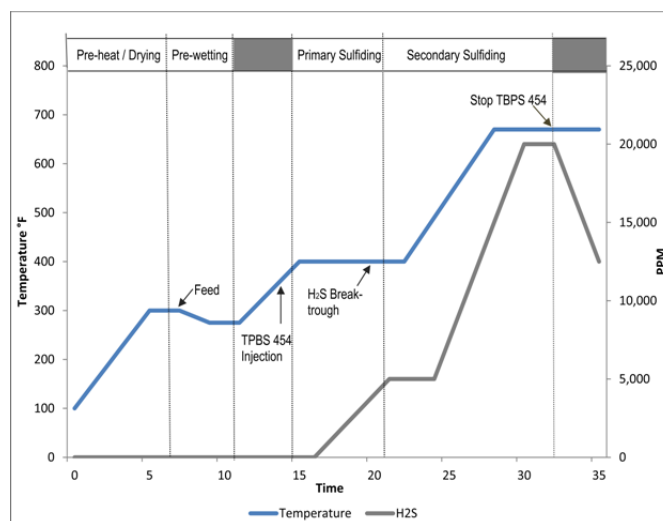
TBPS 454 is di-tertiary butyl polysulfide, a mixture with a predominance of tetra and penta sulfides. It is not a distilled material. It is the highest sulfur content polysulfide manufactured. Other polysulfides available are TNPS 537, TDPS 532, and TDPS 320. These products are utilized in the metalworking lubricant markets.

Figure 1. Decomposition of TBPS 454 in the Presence of a Catalyst



Actual results may vary depending on unit pressure and conditions

Figure 2. Typical Feed Sulfiding Procedure



Before using this product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Chevron Phillips Chemical Company LP does not make, and expressly disclaims, all warranties, including warranties of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.