M Chemical Company’s high quality products are backed up by excellent support and service and the fast responsiveness that is required for this process.

## A Complete Range of Sulfur Recovery Catalysts

We offer a complete range of Sulfur Recovery Catalysts:

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Further information about these products is included in the following product information sheets. If of interest, please feel free to ask for the relevant product data sheets.

## Advanced Technical Support

M Chemical Company has access to test units that can operate as any configuration of Claus and tail gas treatment processes. Some of the services that are offered with our catalysts include testing of used Claus catalyst, as well as performance evaluation and process simulation. Please contact M Chemical Company for more information.
ACTIMAX - Claus Alumina Claus Catalyst

The ACTIMAX - Claus is an activated alumina Claus catalyst, engineered and produced to provide optimal performance in both regular Claus and sub-dewpoint applications.

Excellent porosity
The ACTIMAX - Claus catalyst consists of activated alumina. The catalytic activity is provided by the active surface of the alumina itself.

ACTIMAX - Claus catalyst offers an extremely high surface area (typically about 360 m²/g) on which the main Claus reaction and COS and CS₂ hydrolysis take place. The key is to provide a well developed pore structure, through which reactants can enter, and products diffuse out of the catalyst spheres. For this purpose, the ACTIMAX - Claus offers a very high macro porosity:

The image below shows the large channels that run through the ACTIMAX - Claus catalyst, providing highways that lead to the inside of the catalyst sphere.

Low Density
The high porosity is linked to a low density (about 10% lower than most alumina catalysts), which translates to a cost savings on the required mass of catalyst.

High COS and CS₂ hydrolysis
The physical properties of the ACTIMAX - CLAUS provide it with a high activity for the hydrolysis of COS and CS₂. The following figure shows the performance after severe catalyst aging:

Exceptional performance in sub-dewpoint units
The high porosity of the ACTIMAX - Claus catalyst is also advantageous for application in sub-dewpoint units, such as MCRC, CBA, Sulfreen and Maxisulf. Here, the activated alumina is working as an adsorbent as well as catalyst. The cycle length is determined by the capacity for condensed sulfur that is reached before the catalytic activity decreases due to blockage of access. Increasing the cycle length decreases emissions and improves catalyst lifetime.
ACTIMAX - 222 Titania Claus Catalyst

The ACTIMAX - 222 was developed to complement M Chemical’s range of Claus products with a titania Claus catalyst. It can withstand any comparison with alternative products – both in terms of characteristics and performance – and was designed with all practical matters related to the use of Claus catalysts in mind. It offers the following advantages:

- Long catalyst lifetime
- Maximum sulfur recovery
- High COS and CS\textsubscript{2} hydrolysis rates
- Excellent resistance against sulfation
- Uniform particle size

Two shapes to choose from:
5 mm tablets or 3.5 mm quadrilobe extrudates

The catalyst is available in the shape of 5 mm tablets, each virtually identical in shape and size. The most advanced production technology – normally reserved for pharmaceutical applications - is used to ensure this consistent quality.

The 3.5 mm quadrilobe shape in combination with high strength offers an enhanced external surface area, while conserving low pressure drop characteristics.

Less = more

The loaded density of ACTIMAX - 222 is about 20% lower than that of other titania Claus catalyst. This means that the mass required to fill the same volume of catalyst is about 20% lower, without sacrificing catalytic activity. This translates directly to a cost savings when installing or replacing a catalyst bed.

Testing has shown that the ACTIMAX - 222 QL performs better for COS and CS\textsubscript{2} conversion. The indicated performance applies to a temperature of 300°C and a space velocity of 1832 h\textsuperscript{-1}. Note that the performance is measured on equal volume basis, which means that the mass of loaded catalyst was about 20% lower for the ACTIMAX - 222 QL than for the competitive catalyst.

Although the performance level of the fresh catalysts is quite similar, the ACTIMAX - 222 QL shows a significant advantage as aged catalyst. This is especially apparent after the more severe aging of procedure B.
ACTIMAX - 500 Promoted Claus Catalyst

The ACTIMAX - 500 offers a performance level that lies between that of an activated alumina and that of a titania Claus catalyst. Compared with an activated alumina catalyst, it offers the following advantages:
- Improved CS₂ hydrolysis
- Excellent COS hydrolysis
- Longer lifetime
- Higher resistance to sulfation

ACTIMAX - 600 Claus Oxygen Scavenger

The potential for excess oxygen coming into the reactor poses a risk to alumina Claus catalysts. This is mainly the case when direct-fired reheaters are used, especially when fuel composition is variable and/or control of the burner difficult. The excess oxygen reacts with sulfur species to form sulfates on the catalyst, which reduce its performance. In such cases the ACTIMAX - 600 oxygen scavenger can be used as a guard layer on top of the alumina catalyst.

NOT a hybrid

In efforts to get a catalyst that provides a performance and price level between those of alumina and titania catalysts, so called “hybrid” catalysts have been developed. These consist of a mixture of alumina and titania. However, even an optimized titania distribution has not yielded a catalyst that offers the desired level of performance. Actual reported performance of hybrid catalysts at typical first reactor conditions are similar to those of regular alumina catalysts, and sometimes even worse:

![Graph showing the performance of ACTIMAX - 500 and ACTIMAX - 600 compared to a hybrid catalyst.](image)

The ACTIMAX - 500 is radically different. It employs a proprietary promoter to achieve a CS₂ conversion performance that is significantly higher than that of an alumina catalyst. The COS conversion performance is even more remarkable, and comes close to that of a titania catalyst.

Similarly, hybrid catalysts have been shown to be much more sensitive to poisoning by sulfates from free oxygen than pure alumina. ACTIMAX-500 can tolerate up to three times as much sulfate than a pure alumina catalyst before showing signs of reduced activity.

Maximum activity at low temperatures

For a given flow rate and amount of scavenger, the extent of protection against free oxygen depends on the temperature of operation and the intrinsic activity of the scavenger. The most crucial is the performance at typical third Claus reactor conditions. The low temperature of operation poses the highest requirement on the intrinsic activity of the scavenger, while at the same time the risk of sulfation of the alumina catalyst is highest due to the increased stability of sulfates at lower temperature. This is where the ACTIMAX - 600 excels: even at contact times below one second, very high levels of oxygen conversion are reached:

![Graph showing oxygen conversion vs. temperature for ACTIMAX - 500 and ACTIMAX - 600 compared to a best competitive scavenger.](image)

An increase of the contact time to about two seconds allows 100% conversion of oxygen to be reached for this whole temperature range. Replacing part of a bed of alumina Claus catalyst with a scavenger is no concern for the Claus performance, since the Claus activity of the ACTIMAX - 600 oxygen scavenger is at the same level as the alumina catalyst.

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DURAMAX - AAS Active Bed Support

DURAMAX - AAS Active Bed Support can usually be used as bed support or topping in Claus reactors. Replacing inert ceramic balls with active bed support offers the following advantages:

- Added catalytic activity
- Lower loaded density

More than a support

The DURAMAX - AAS active bed support consists of the same material as the ACTIMAX - Claus catalyst. In addition to physical support or topping, the DURAMAX - AAS active bed support therefore works as catalyst as well.

The lower density, compared to inert ceramic materials, means that less mass of active bed support is required to provide the required volume of support/topping.