

# Application Notes

FeCl<sub>2</sub>  
NH<sub>4</sub>OH  
HCL  
Density  
FeSO<sub>4</sub>  
Slurries

▶ **H<sub>2</sub>SO<sub>4</sub> - Sulphuric acid & Oleum**

NaOH

Slurries



## Application

Sulphuric acid is a very important raw material in the chemical industry and is used in many different processes.

Oleum is produced by dissolving SO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub>. Sulphuric acid is produced by dissolving water in oleum. This is the so called double contact process.

To follow the process of dilution, an accurate and reliable real time in line analyser is needed.

Rhosonics has developed a very accurate analyser, based on density and speed of sound, to determine its concentration in parts or in the full range. The concentration of aqueous solutions of sulphuric acid or oleum is reported as %w/w H<sub>2</sub>SO<sub>4</sub>.

## Industries

This application can be found in many industries, like:

- Raw chemicals industry in the production of phosphoric acid and hydrofluoric acid
- Paint industry for production of Titanium oxide
- Fertilizers
- In the production of Battery acids
- Steel industry in Pickling baths

## Description

Sulphuric acid or oleum are used in several industries either in concentrated form or in dilutions down to a few ppm. In practice, the product can be measured with high accuracy in a well equipped laboratory using density meters. But above 90% saturation, density analysers do not give the accuracy that is needed for reliable process control. Other sensors, like conductivity sensors, refractive index meters or coriolis meters, simply lack sensitivity for specific applications, or do not seem to respond anymore at larger concentrations.

Rhosonics has developed a new method for control of the full range. It is the combined density and speed of sound analyser in one sensor. Now, the full range from 0 to 120%w/w H<sub>2</sub>SO<sub>4</sub> can be monitored with the ternary analyser Model 9580. This is the most accurate insitu real time process analyser on the market.

The Chemicals Analyzer of the Future

## Model selection

### Controller:

Model 8500 Inline Process Analyzer for concentrations up to 100% H<sub>2</sub>SO<sub>4</sub>

Model 9580 Ternary Process Analyser for concentrations up to 130% H<sub>2</sub>SO<sub>4</sub>

### Sensor:

8500 combined with UMP-130 or UMP-48 US sensor

9580 combined with wafer sensor

### Options:

Cables, connectors, enclosures, system integration

## Graph

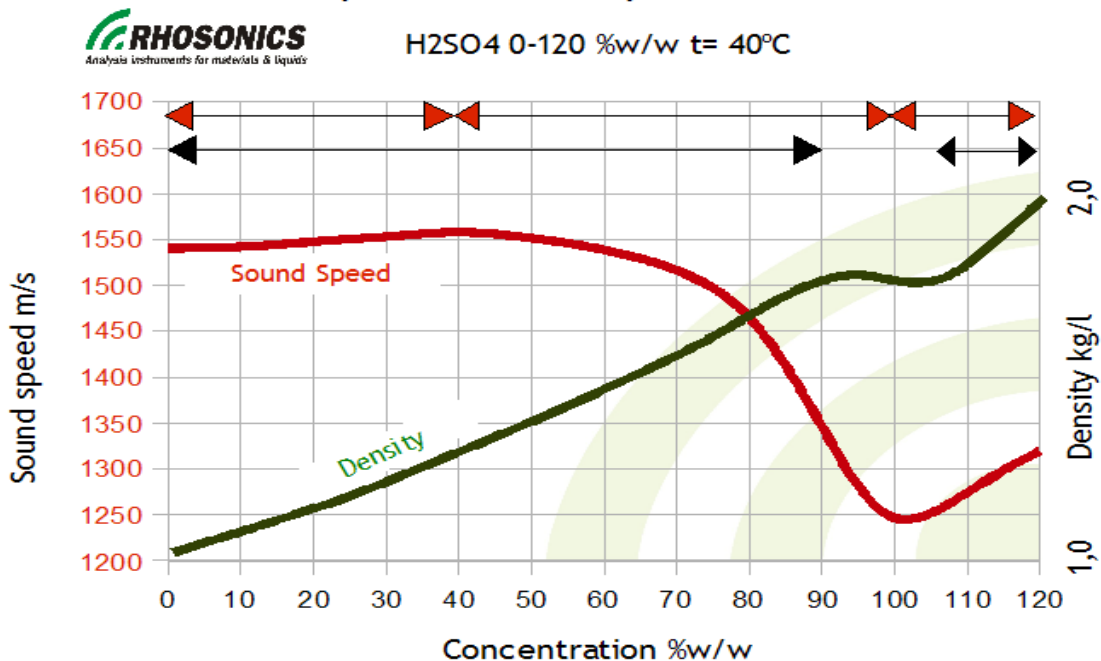
The graph below shows that for the full range H<sub>2</sub>SO<sub>4</sub> 0-120 %w/w, the US speed of sound determination needs an external signal to determine in which of three ranges it measure to determine the concentration. Density needs two ranges, but misses a part of the graph in which density is not possible. By applying both technologies in one sensor, it is now possible to calculate the exact concentration over the full range, without the need for external range information!

## Benefits

For this application our UMP probes are suitable, but also the new hybrid ultrasonic technology can be used for the determination of oleum. The benefits is that the temperature is measured based on ultrasonic technology; we measure the speed of sound and we also determine the density of the liquid. Other benefits are:

- Very low price and cost of ownership
- High accuracy and reproducibility
- Maintenance free
- No cleaning needed
- No moving parts
- No reagents
- Insitu, spool and wafer sensor technology
- High-end software technology, easy to operate
- Colour graphics touch screen display
- Datalogging
- Various communication protocols, like Modbus

## Sound speed & Density vs. concentration





## The Solution Specialist

The mission of Rhosonics Analytical is to provide solutions for In-line concentration analysis of virtually all existing process liquids, including electrolytes, emulsions, suspensions and slurries.

For almost two decades, Rhosonics Analytical has been focusing on the development and employment of high-performance ultrasonic technologies for in-line liquid concentration analyzers and non-destructive testing of materials.

### Our products

- In-line concentration analyzers for virtually all existing process liquids, including solutions, electrolytes, emulsions, suspensions, solids and slurries.
- Piezo composite transducers for Ultrasonic NDT (Non-Destructive Testing) for new inspection methods, including ToFD and Phased Array.

### The Solution Specialist

Rhosonics Analytical is The Solution Specialist for the design, production and supply of ultrasonic in-line process analyzers for liquids and slurries in any industry world wide.



## Contact & Distributors

Rhosonics Analytical BV  
Midden Engweg 37A  
NL-3882 TS PUTTEN  
THE NETHERLANDS

Tel. +31 (0)341 370073  
Fax.+31 (0)341 370074

[www.Rhosonics.com](http://www.Rhosonics.com)



Worldwide distribution.  
Please check our website for details.



**Rhosonics - The Solution Specialist**