

Accurate Determination of Sulfuric Acid Concentration

Accurate determination of sulfuric acid within the chemical, accumulators, fertilizers, metal, and plastic industries.

The Density – Concentration Relationship of H₂SO₄

In April 2022 there is a change coming to the European Pharmacopoeia regarding the measurement of essential oils such as Sweet Orange Oil. The revised monograph requires that samples now need to be measured in a 0.1 dm (10mm) length cell instead of the standard 100mm polarimeter cell.

Example of essential oil that is required to be tested in a 0.1 dm (10mm) length cell.

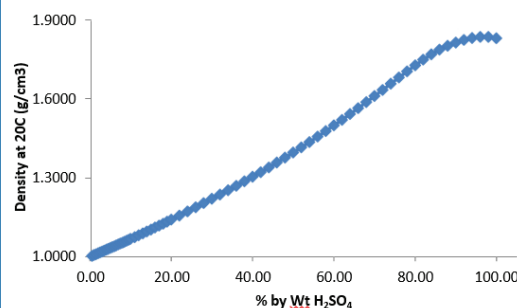


Fig. 1 Density of H₂SO₄ vs. concentration

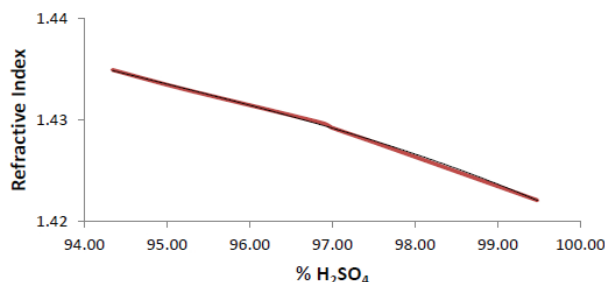


Fig. 2 Refractive Index of H₂SO₄ vs. concentration

In order to solve this inconvenient and be capable of analyzing beyond 90 % with total confidence, Rudolph Research Analytical adds a second piece of advanced technology that determines the Refractive Index of Sulfuric Acid at high concentrations beyond 90 %, such as in the J457OM-SV-H refractometer where the behavior of the curve is stable. See Figure 2

This combination of reliable technologies provide a more rapid, less complex solution for determination of Sulfuric Acid concentration throughout its entire range. Rudolph Research Analytical offers various choices of Density meters depending on the accuracy required during determination of concentration of the Sulfuric Acid concentration. Table 1 summarizes all the available options.

Table 1. Sulfuric Acid concentration range measurement capability for each Density meter J457OM-SV-H refractometer

Instrument model	Resolution (g/cm ³)	Accuracy (g/cm ³) at 20°C	Sulfuric Acid (%w/w)	Necessary options
DDM2911	0.00001	0.00005	0-90 %	Acid resistant side panel
DDM2911 Plus	0.000001	0.00001	0-90 %	Acid resistant side panel
J457OM-SV-H refractometer	0.00001	0.00002 RI*	90-100 %	Hastelloy sample well prism

* Accuracy in Refractive Index units

Figure 3 shows a Density meter, either DDM2911 or DDM2911 Plus paired with a J457OM-SV-H refractometer where the sample gets manually injected by means of a syringe and directly poured onto the refractometer's sample prism.

Cautions to be taken with H₂SO₄

First and foremost, wear proper protective equipment (PPE), gloves, safety glasses, safety boots, lab coat, etc. as Sulfuric Acid is very corrosive to human tissues. Also, care needs to be taken during the cleaning out of the acid; as Sulfuric acid reacts exothermally with water! If doing manual cleaning push the Sulfuric acid out with an empty syringe using air pressure or simply push air from the air pump in automated systems. Only once nearly all the Sulfuric acid is out of the U-tube you can use several diluted Sulfuric acid rinses as the first, second and may be third rinse. Push them out again with just the air pressure from an empty syringe or automated solutions. Then and only then, you may rinse with water as a solvent. Use Alcohol, not acetone as the drying solvent.



Fig. 3 Setup for determining high concentrations of H₂SO₄. Showing manual injection