TI-2
Chemicals for Anodising

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Below you will find all relevant data for the use of our additional chemicals for anodizing: sealing solution, sealing solution 90, sealing salt, aluminum cleaning agent, foaming additive, and foaming additive for etching baths.

General Note:
Please be sure to also follow the safety instructions in our anodizing guide and on the chemical labels!

Sealing solution (Article № 0160 and 0161)

Our sealing solution improves sealing quality. It makes the surface harder and colorings more durable. It also prevents the formation of unwanted sealing deposits and allows the use of baths with lower water quality. In addition, this solution is necessary for the two-step sealing process described further below.

The following parameters should be observed:

- **Concentration**
  For each liter of sealing bath, add 1–2 ml of sealing solution for uncolored aluminum and 2–3 ml for colored aluminum. The pH value should then automatically stabilize at 5.5–6.0.

- **pH Adjustment**

  If the pH value changes over time (e.g., due to acid carryover, etc.), you can restore the optimal value (pH 5.5–6.0) by carefully adding ammonia solution (raises the pH) or acetic acid (e.g., diluted vinegar essence; lowers the pH).

Sealing solution 90 (Article № 0194 and 0195)

Our Sealing Solution 90 improves sealing quality. It makes the surface harder and colorings more durable. It also prevents the formation of unwanted sealing deposits and allows the use of baths with lower water quality. In addition, this solution is necessary for the two-step sealing process described further below.

A major advantage of this additive is that the sealing temperature does not exceed 90 °C, preventing the bath from boiling and evaporating. This results in significant energy and material savings and considerably reduces the release of water vapor into the environment.

The following parameters should be observed:

- **Concentration**
  Add **1–2 ml** of sealing solution per liter of bath for uncolored aluminum, and **2–3 ml** for colored aluminum. The pH value should then automatically stabilize at 5.5–6.0.

- **pH Adjustment**
  If the pH value changes over time (e.g., due to acid carryover, etc.), you can restore the optimal value (pH 5.5–6.0) by carefully adding ammonia solution (Salmiakgeist; raises the pH) or acetic acid (e.g., diluted vinegar essence; lowers the pH).

The sealing temperature depends on the intended application (although a higher temperature never causes any harm):

- For exterior architectural applications, in saltwater and automotive environments, as well as for applications subject to high UV exposure, we recommend sealing at **90 °C**.
- For all other applications with lower stress, bath temperatures of **85 °C** are usually sufficient.

The duration of sealing mainly depends on the coating thickness and should be based on the following values:

- **2 minutes per µm of coating thickness** for standard sealing quality
- **3 minutes per µm of coating thickness** for outstanding sealing quality

To determine the coating thickness: as a rough guideline, under standard anodizing conditions (anodizing bath at 20 °C, 1.5 A/dm²), a layer thickness increase of approximately 1 µm per three minutes can be assumed. If in doubt, precise values should be determined—at least on a sample basis—using a coating thickness gauge.

Sealing salt (Article № 0167)

A solution containing our sealing salt results in very rapid pore closure through immediate nickel impregnation. This is particularly advantageous for lighter colorings, as bleeding is practically eliminated. It also achieves the highest coating qualities in terms of light and weather resistance. In addition, the salt contains a dispersant to prevent surface deposits and a buffering agent to keep the pH value stable.

Preparation of the sealing salt solution

The powder dissolves easily in warm water, so it should be stirred into water at 30–40 °C. If sufficient time is available, the powder can also be dissolved at room temperature. The resulting solution is clear and slightly greenish. For virtually all applications, prepare the solution at a concentration of **5 g of seal salt** per liter.

Storage life

The powder has a shelf life of at least five years when stored dry in suitable containers. Prepared, clean solutions should keep for at least one year when protected from light. In practice, the shelf life is usually significantly longer.

Disposal

Like all substances containing heavy metals, the sealing salt and its solution are subject to special disposal regulations. Further details on simple and efficient disposal can be found in Technical Bulletin TI-5.

Under no circumstances may spent bath solutions be poured down the drain!

Types of Sealing

In general, coating quality increases with the effort applied (a two-step sealing is better than a single-step process, deionized water is better than tap water, etc.). A simple sealing (e.g., using only our Sealing Solution or Sealing Solution 90) is entirely sufficient for richly colored coatings and basic requirements. Problems usually arise when the coatings are thin, a pale coloration is desired, or very high light and weather resistance is required.

For these highest demands, we strongly recommend a so-called two-step sealing. In this process, the surface is first briefly treated with the sealing salt solution, followed by the main sealing in boiling water with the addition of sealing solution. This does not mean that a single-step sealing is inherently inadequate—in fact, very good results can already be achieved with it. It is always a matter of balancing the intended application against the effort involved.

Please note: the use of our sealing salt may cause slight color variations compared to sealing with Sealing Solution alone.

The following sealing methods are listed in ascending order of quality: the last method listed therefore results in the highest layer quality.

Single-Stage Sealing (Type 1):

- Concentration: **2-3 ml Sealing Solution or Sealing Solution 90** per liter
- Water quality: tap water or (preferably) deionized water
- pH value: 5,7 +/- 0,3 (is normally self-adjusting; adjust if necessary using acetic acid/ammonia)
- Temperature: **96 °C minimum (Sealing Solution 90: 90°C)**
- Duration: **2-3 minutes per µm** of layer thickness
  For typical layer thicknesses, 30–45 minutes should be sufficient. A longer treatment time is not critical.

Single-Stage Sealing (Type 2):

- Concentration: **5 g Seal Salt** per liter
- Water quality: tap water or (preferably) deionized water
- pH value: 5,7 +/- 0,3 (is normally self-adjusting; adjust if necessary using acetic
- acid/ammonia)
- Temperature: **96 °C minimum**
- Duration: **2-3 minutes per µm** of layer thickness
  For typical layer thicknesses, 30–45 minutes should be sufficient. A longer treatment time is not critical.

Two-Stage Sealing:

- **Stage 1** (Pre-Sealing):
  - Concentration: **5 g Seal Salt** per liter
  - Water quality: tap water or (preferably) deionized water
  - pH value: 5,7 +/- 0,3 (is normally self-adjusting; adjust if necessary using acetic acid/ammonia)
  - Temperature: **75 °C**
  - Duration: **5 minutes**

- **Stage 2** (Main Sealing):
  - Concentration: **2-3 ml Sealing Solution or Sealing Solution 90** per liter

- Water quality: tap water or (preferably) deionized water
- pH value: 5,7 +/- 0,3 (is normally self-adjusting; adjust if necessary using acetic acid/ammonia)
- Temperature: **96 °C minimum**
- Duration: **2-3 minutes per µm** of layer thickness
  For typical layer thicknesses, 30–45 minutes should be sufficient. A longer treatment time is not critical.

An intermediate rinse in water between stage 1 and stage 2 is not strictly necessary; however, it is recommended to improve the service life of the second bath.

Practrical Note:
Stage 2 is, incidentally, identical to the bath used for single-stage sealing when only our sealing solution is used (see above). You can therefore always decide as required: if two-stage sealing is necessary, use both baths; otherwise, use only the appropriate one. This keeps effort to a minimum while ensuring maximum flexibility.

Cleaning Agent for Aluminium (Article № 0162)

This cleaning agent facilitates the cleaning and preparation of aluminum workpieces prior to transfer into the actual anodizing bath.
The following parameters should be observed:

- **Pre-cleaning**
  For heavier contamination from cutting oils, lubricants, etc., a brief wash in a diluted solution is recommended in order to extend the service life of the cleaning bath.

- **Water quality**
  Whenever possible, you should use deionized (= distilled) water. This extends the service life of the bath. However, the cleaning agent is also sufficiently effective in normal tap water.

- **Bath concentration**
  At the beginning, you should use **30–50g** of cleaning agent per liter. It is best to dissolve this in pre-warmed water.

- **Bath temperature**
  The bath temperature should be maintained in the range of **55–70°C** during cleaning.

- **Treatment duration**
  The treatment time should be **3–15 minutes**, depending on the degree of contamination.
  Slight gas formation on the workpiece during this time is normal and harmless.

- **Bath movement**
  Since the product produces very little foam, air injection or circulation using a stirrer, etc. is easily possible and recommended due to the improved cleaning effect. Of course, you can also manually agitate the component in the bath. In this case, it must no longer be touched (therefore it is best to mount/attach it to a titanium rack beforehand).

- **Bath replenishment**
  If the cleaning performance decreases, additional cleaning agent may be added up to approximately 100 g/liter. After that, the bath should be completely replaced.

- **Rinsing**
  To avoid contamination by foreign ions and to remove residual dirt, the workpieces should

be thoroughly rinsed **after** the cleaning bath (preferably by spraying and immersion washing) in distilled water. The surfaces to be anodized must no longer be touched after the cleaning bath!

- **Storage and shelf life**
  The powdered cleaning agent has an essentially unlimited shelf life under normal storage conditions (preferably airtight), but at least 5 years.

Foam Additive (Article № 0193)

During anodic oxidation with sulfuric acid electrolytes, harmful and corrosive acid mist is generated. Our foam additive forms an extremely fine, closed foam layer immediately after the start of the current flow due to the evolution of hydrogen at the cathode, which completely prevents the formation of acid vapors and also effectively eliminates the risk of oxyhydrogen gas explosions. Impurities in the bath are bound in the foam and can be easily skimmed off. This keeps the anodizing bath consistently clean and extends its service life. The foam additive also promotes a uniform layer build-up and is therefore advantageous even when an extraction system is in place.

Application
The additive is largely acid-resistant and can be added directly to the anodizing bath. The amount we recommend is calculated so that the foam layer reaches a height of approximately 5 to 10 mm and is only about 0.05 g/l.

If foam formation decreases, it is usually sufficient to add about one quarter of the original amount.

Foam Additive Etching (Article № 0199)

When using alkaline pickling baths—especially those based on Sodium hydroxide—harmful and corrosive fumes are generated due to strong hydrogen evolution. This foam additive forms a fine-pored, closed foam layer over the pickling baths as a result of the escaping hydrogen, effectively preventing the formation of fumes and practically eliminating the risk of flash ignition events.

Contaminants in the bath are bound within the foam and can be easily skimmed off. This keeps the pickling bath consistently clean and extends its service life. The foam additive also promotes uniform pickling, prevents staining, improves drainage behaviour, and is therefore advantageous even when an extraction system is in place.

Furthermore, this additive can also be successfully used in sealing baths based on our sealing salt. In this case, the sealing process becomes more uniform, and problematic workpieces show a reduced tendency to form stains.

Application
The additive is largely alkali-resistant and can be added directly to the pickling bath. The recommended amount is calculated so that the foam layer reaches a height of approximately 5 to 10 mm and is only about 0.05–0.2 g/l. If foam formation decreases, it is usually sufficient to add about one quarter of the original amount.

In sealing baths based on seal salt, please add a slightly higher amount of the additive: 0.3–0.5 g/l.

If you have any further questions (even if they are of a simple nature), please do not hesitate to contact us. Everyone has to start somewhere, and experience shows that there are always questions for which no answer can be found elsewhere. If we are exceptionally unavailable by phone, please leave your name and phone number on our answering machine. We will call you back as soon as possible.

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