



SOLVAY CHEMICAL SECTOR – SBU FLUOR

SOLVAY FLUOR UND DERIVATE GmbH & Co KG

Technical Services – NOCOLOK® Flux Product Range (SFD-AN)

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NOCOLOK® Sil Flux – TECHNICAL INFORMATION

Commercial Use of NOCOLOK® Sil Flux – General Comments

Currently, the only commercial use of NOCOLOK® Sil Flux in CAB technology is for **manufacturing parallel flow condensers (PFC)**.

Usually, the tubes of this heat exchanger type are multiport extrusions. These **tubes** are **pre-coated with NOCOLOK® Sil Flux** in special processes either before or after they are cut to length. Thereafter they are assembled with the headers and fins.

NOCOLOK® Sil Flux – Application

The coating procedures for NOCOLOK® Sil Flux were developed by some of our customers (in collaboration with extruders) and most of these techniques are patented (e.g., Denso-SLM, OKB-NLM, Hydro, Erbslöh).

For the success of NOCOLOK® Sil Flux, the **precise flux load and the uniformity of the coating are extremely important**.

When applying NOCOLOK® Sil Flux the following must be considered:

- **Filler metal generation with a mixture of silicon powder and flux powder requires a very thin and absolutely uniform coating.**
- **Only selected surfaces on which filler metal can be generated (i.e. with sufficient base metal thickness) should be coated.** Fin sheet is usually too thin to be coated with NOCOLOK® Sil Flux.
- **Too much silicon powder (i.e. too heavy or non-uniform coating) will result in massive erosion (core metal dissolution and penetration).**

There are two additional points to consider:

- a) NOCOLOK® Sil Flux technology requires very good furnace atmosphere conditions (i.e. very low oxygen - 50 to 100ppm - and low humidity levels - below -40°C), and
- b) When using NOCOLOK® Sil Flux, the maximum Mg level in aluminium alloys should be 0.02%. Higher Mg levels prevent the silicon particles from diffusing into the aluminium – thus no filler metal is generated.

The concept of NOCOLOK® Sil Flux allows to braze non-clad aluminium alloys. However, the Sil Flux application process cannot directly be compared with standard NOCOLOK® Flux application.

NOCOLOK® Sil Flux – Flux Load

NOCOLOK® Sil Flux works at flux loads of approximately 15 - 25g/m².

The mixing ratio for Sil Flux slurries or pasts depends on the application method on site. In some cases, the main focus is a specific viscosity for an automated fluxing system. In other cases, only small flux quantities are prepared for immediate consumption.

NOCOLOK® Sil Flux – Slurry and Paste Preparation

Slurries or pasts of NOCOLOK® Sil Flux can be prepared with **de-ionised water and/or alcohol** (ethanol or isopropyl alcohol) as well as **alcohol/water mixtures** (70% alcohol content) in any ratio from 10 to 60 wt% (solids). When alcohol-based mixtures are used, caution must be taken concerning flammability and explosion limits.

The actual slurry concentration will depend on the application procedure. The objective is to achieve 15 – 25g/m² flux load per surface area. If the Sil Flux slurry or paste is not completely consumed within 1 or 2 days after mixing, it should be solvent-based (e.g., using pure alcohol as carrier) to avoid potential chemical reaction between the solvent and the silicon metal powder (water reacts with the metal powder). Brushing, dipping or spraying can be utilised to apply the flux. Care must be taken, because application by brushing can result in too high flux loads. With excessive flux coverage, the process does not work!

Before the parts are brazed, the NOCOLOK® Sil Flux slurry or paste coating on the component surfaces must be completely dried or allowed to evaporate. If alcohol is used as a carrier, the evaporation will only take a few moments (at 15 to 25g/m² flux load) – but an exhaust treatment can be necessary. Water-based slurries will take longer to dry.

NOCOLOK® Sil Flux is non-hygroscopic (i.e. the flux does not attract and absorb moisture) and non-corrosive (i.e. there is no reaction between the flux and the aluminium surfaces at room temperature). If a water mixture is used as the flux carrier, the components should be dried immediately after flux application to avoid water-related corrosion effects.

Paste or slurry concentration is only one factor affecting final Sil Flux load. Other parameters are: surface cleanliness, surface wettability, surface structure and design.

As a starting point, a 20-30% NOCOLOK Sil Flux slurry can be used. But the focus must always be on the final load after drying, and not just on the slurry concentration.

NOCOLOK® Sil Flux – Application with NOCOLOK® Binder Products

NOCOLOK® Sil Flux can be **spray coated** using **NOCOLOK® Binder** mixtures (please refer to the Technical Information for NOCOLOK® Binder products). In this case, the recommended mixing ratio/ quantity for NOCOLOK® Flux is replaced by NOCOLOK® Sil Flux.

NOCOLOK® Sil Flux – Additional Comments

- For the header to tube area in a radiator, only a very sophisticated application method will work. Spraying a suspension of Sil Flux on pre-formed headers can be a suitable procedure.
- Electrostatic/dry application is not suitable for NOCOLOK® Sil Flux due to explosion limits for silicon metal dust.

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