



SOLVAY CHEMICAL SECTOR – SBU FLUOR

SOLVAY FLUOR UND DERIVATE GmbH

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

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NOCOLOK® Sil Flux – TECHNICAL INFORMATION

NOCOLOK® Sil Flux – Pots and Pans Production

The following text provides some answers on general questions regarding the use of NOCOLOK® Sil Flux for manufacturing pots and pans.

1) What is the NOCOLOK® Sil Flux quantity (per cm²) required for sandwich brazing or pressure cookers (stainless steel to aluminium)

The recommended load for NOCOLOK® Sil Flux is approximately 15 to 25 g/m². Brazing aluminium to stainless steel requires rapid processing, i.e. very fast heating ramp and short time at brazing temperature. Usually, this can only be accomplished with induction brazing.

When brazing aluminium to stainless steel using NOCOLOK® Sil Flux, the Sil Flux first forms the filler metal from the aluminium component. The filler metal then reacts with the stainless steel to form a thin layer of FeAl₃.

From a metallurgical point of view, there is a multi-layer system (microscopic structures). First, there is the stainless steel, then the layer of FeAl₃, then the Al/Si filler metal, and finally the aluminium substrate. The FeAl₃ layer is very brittle, and so it is important that this layer is kept as thin as possible. The thickness of this layer is a function of time and temperature, - consequently the need for a short brazing cycle.

2) To prepare a NOCOLOK® Sil Flux slurry or paste: What is the exact mixing ratio (flux to solvent) required.

The mixing ratio for NOCOLOK® Sil Flux slurries or pastes 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 can be prepared with alcohol (ethanol or isopropyl alcohol) or alcohol/ water mixtures (70% alcohol content) in any ratio from 20 to 60 wt% (solids). As mentioned earlier, the actual slurry concentration will depend on the application procedure. The objective is to achieve 15 – 25 g/m² surface area.

If the NOCOLOK[®] Sil Flux slurry is not completely consumed within one or two days, we recommend to use pure alcohol as carrier to avoid any chemical reaction between the solvent and the metal powder (silicon). Due to hydrolysis of the silicon powder, water should not be used to prepare NOCOLOK[®] Sil Flux paste.

Brushing, dipping or spraying can be utilised to apply the flux. Uniformity of the applied flux coating is very important.

3) How fast after applying NOCOLOK[®] Sil Flux, the components should be processed for best results?

Before the part is heated up, the NOCOLOK[®] Sil Flux slurry or past coating on the component surfaces should be thoroughly dried or allowed to evaporate. If alcohol is used as a carrier, the evaporation will only take a few seconds (with 15 to 25 g/m² flux load). 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 metal surfaces at room temperature). If a water mixture is used as the flux carrier, the components should be dried after flux application to avoid water-based corrosion effects.

4) What is the grain/ particle size distribution of the silicon metal powder in NOCOLOK[®] Sil Flux?

The silicon particles in NOCOLOK[®] Sil Flux show a particle size distribution curve with most of the grains within a range of 10 to 45µm. The Solvay specification for NOCOLOK[®] Sil Flux (coarse grade) (which is used for brazing pots and pans) is as follows:

< 5µm:	< 25%
10 - 20µm:	50%
> 35µm:	< 10%

5) What are the key points regarding product fit-up for good joint formation in NOCOLOK[®] Sil Flux technology?

During the brazing process it is important that the components to be joint are in intermediate contact with each other. There must be firm pressure applied on all the surfaces of the plates throughout the brazing cycle to avoid large voids and gaps. Filler metal can only fill gaps up to a certain width (i.e. approximately 0.1 to 0.15 mm).

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