



SOLVAY GBU SPECIAL CHEMICALS

SOLVAY FLUOR GmbH

Technical Marketing & Sales - NOCOLOK® Product Range

Hans-Böckler-Allee 20 · D-30173 Hannover

Telephone: +49 / 511 / 857-3329 · Fax: +49 / 511 / 857-2146

NOCOLOK® Flux – TECHNICAL INFORMATION

NOCOLOK® Binder, NOCOLOK® Thickener, NOCOLOK® System Binder, and NOCOLOK® Flux plus Binder Mixture

Preparation and Application

This flyer provides information about the application of binder-based formulations and systems for NOCOLOK® Flux.

Solvay offers three concepts for flux binder application:

- **NOCOLOK® Binder** (water-soluble) / **NOCOLOK® Thickener** (water-soluble)
This option means preparing the mixtures on site just before usage
Please refer to a separate document with detailed mixing instructions
- **NOCOLOK® System Binder** (water-based)

and

- **NOCOLOK® Flux plus Binder Mixture** (water-based)
Ready-to-use formulation

All products can be used in water-based NOCOLOK® Flux slurries to improve flux particle adhesion. This is of particular interest for fluxing of pre-formed components prior to assembly in order to reduce flux fall-off and dust formation. Binders are also helpful to pre-coat certain areas with specific flux loads. All binder mixtures can be applied on external and - with some special care - also on internal surfaces.

During the brazing cycle, these binders will completely evaporate (mostly between 350 and 400°C). When used as described below, there will neither be detrimental interactions between the binder and the flux, nor between the binder and the aluminum surfaces. Tests have shown that even at four-times the standard flux load with a binder mixture there was still no surface discoloration after brazing.

General Comments:

The surface areas to be coated with binder mixtures must be free of lubricants, oils, dirt, and dust.

Means of application include spraying, dipping, and brushing.

All NOCOLOK® Flux binder mixtures can be applied by spraying with a suitable spray gun (0.8mm - 1.2mm) at approximately 3 - 5 bar pressure.

The surface temperature should be at least 10°C.

When binders are used for flux application, the recommended flux load for good brazing results is the same as it is for the standard process (i.e. between 3 and 5g/m²). The thickness of the binder coating is usually between 10 and 30µm.

Drying can be done in air - requiring approximately 15 - 20 minutes at room temperature for the coating surface - and 50 - 60 minutes before the parts can be handled. Oven and forced convection drying is feasible too: e.g. at 50 - 80°C, parts will dry within a few minutes - depending on part design, coating weight and convection. The most common drying method is with a hot air blow. Particularly when using painting machines, this method is recommended. The maximum air temperature should not exceed 180°C.

For detailed information regarding the safe handling of the binder products, please refer to the Safety Data Sheets.

Preparation of Binder Mixtures:

For all binder concepts and preparations, the mixtures should be prepared or opened immediately before consumption.

To prepare a mixture free of agglomerates and to achieve best coating results, the following procedures must be observed for either binder concepts:

- **NOCOLOK® Binder / NOCOLOK® Thickener**

- **45 parts (wt%) de-ionized water** (as used for preparing standard flux slurries) is mixed thoroughly with
- **15 parts (wt%) NOCOLOK® Binder** (water-soluble) and
- **5 parts (wt%) NOCOLOK® Thickener** (water-soluble).

Once the first three components are completely homogenized,

- **35 parts (wt%) NOCOLOK® Flux** powder are added successively under continuous agitation.

The above composition is recommended as 'Standard Composition'. It is the best choice for pre-fluxing external surfaces, e.g. headers. For application on internal surfaces, modified ratios need to be used. The optimal composition will depend on part design, adhesion requirements, and process conditions. Therefore case by case adjustments should be considered.

- **NOCOLOK® System Binder**

NOCOLOK® System Binder (water-based) already contains the binder and thickener component as well as water. Consequently, only NOCOLOK® Flux powder must be added.

- **65 parts (wt%) NOCOLOK® System Binder** (water-based) plus
- **35 parts (wt%) NOCOLOK® Flux**.

- **NOCOLOK® Flux plus Binder Mixture and modified NOCOLOK® Flux plus Binder Mixtures**

NOCOLOK® Flux plus Binder Mixture (water-based) is a ready-to-use preparation containing NOCOLOK® Binder, NOCOLOK® Thickener, and NOCOLOK® Flux.

Modified NOCOLOK® Flux plus Binder Mixtures contain special additives for further reduced settling and improved re-mixing behavior.

If necessary, the mixtures can be passed through a sieve prior to use. This will remove potential agglomerates.

Prior to use, the flux powder in the mixture must be suspended, therefore when stored for some time or diluted, the mixture must be well stirred before spraying.

The binder component is activated by oxygen from air. Once sprayed and dried, the product cannot be recycled or reused.

Any remaining flux / binder mixture should be stored in an airtight and sealed container. Once the container was opened, we recommend consuming the mixtures within one week after mixing.

Additional Information:

- NOCOLOK[®] Binder, -Thickener, and -System Binder are compatible for standard NOCOLOK[®] Flux, -LM Flux, -Cs Flux, and -Sil Flux. They are not suitable for NOCOLOK[®] CB Flux, -Zn Flux, and Li Flux - due to chemical reactions between these fluxes and the ingredients. For NOCOLOK[®] Zn Flux and Li Flux, we offer an alternative binder product: NOCOLOK[®] Precoating.
- The formulations (mixing ratios) provided in Solvay's technical information sheets and brochures are intended as general recommendations. They provide the best basis for automated spray application and have been tested with good brazing results.
- The recipes can be adjusted to specific application needs by changing the mixing ratios within certain ranges.
- It must be observed that higher binder ratios result in a harder coating layer and stronger flux adhesion. But they require more care for the binder removal step.
- Very high binder and/ or thickener ratios increase the organic content in the mixture, which may result in carbon residues after brazing (discoloration).
- It is possible to reduce and/ or to increase the water content of the mixtures – resulting in higher respectively lower viscosity.
- Water dilution will cause less wetting action and lead to reduced adhesion.
- A surfactant (wetting agent) is part of the formulation. It provides uniform coating, and can handle - to some extent - surfaces not thoroughly cleaned prior to application.
- NOCOLOK[®] Thickener is used for adjusting the viscosity and to keep the flux powder longer suspended. This provides better performance in spray application. Nevertheless, when the mixtures are consumed in a short period of time after mixing, they can be prepared and used without addition of thickener.
- Cleaning before binder-based flux application is recommended - but not mandatory.
- Clean surfaces can be coated more easily and uniformly - and flux adhesion is going to be better.
- Residual oils and lubricants are reducing binder activity and require higher flux load. They can potentially cause black or brownish discoloration and result in poor brazing.
- Higher surfactant levels can compensate for some contamination – but result in more foaming.

Binder Flux Mixing Ratios:

- The standard composition is 35% NOCOLOK[®] Flux, 15% NOCOLOK[®] Binder, 5% NOCOLOK[®] Thickener and 45% water. If a product with lower flux ratio is wanted – lets say for example with only 10% flux, the composition needs to be adjusted. The following aspects should be considered:
 - With 35% flux, the ratio of flux to binder/ thickener on the surface of the headers is sufficient to combat the effects of the organic binder ingredients. Also, 15% binder has reasonable adhesion characteristics.
 - At flux contents in mixtures equal or below 15%, the ratio of flux to binder and thickener must be modified; otherwise there may not be sufficient flux to combat the organic content. Therefore, we suggest reducing the binder and thickener content in such cases correspondingly, because too much binder and thickener with not enough flux may lead to discoloration on the parts after brazing and/or difficulties in brazing.

Warehousing Considerations and Shelf Life:

- Under standard storage conditions, the shelf life is up to 12 months and probably longer. Standard storage conditions means that the product is stored at less than 30°C, and never below sub-zero temperatures. Once the mix is frozen it is not suitable for application upon thawing any more; as stated in the Safety Data Sheet.
- The binder product can be stored at a temperature higher than 30°C, but the shelf life will shorten due to premature aging. Therefore, we cannot warrant for the entire shelf life for the binder products when they are stored at 40°C or warmer. Storage at higher temperature causes premature aging of the binder resulting in severe deterioration of the mixture properties. This is due to generic product properties of water-based polymer systems and adhesives.
- Under no circumstances should the binder products, in their original packaging, be exposed to a temperature of 60°C or above. We suspect that polymerization will occur, agglomerates will form and the performance will deteriorate.

Thermo-Gravimetric Analysis (TGA) for Binder Flux:

- Please refer to the flyer "NOCOLOK® Flux Application with Binders".

Recommendations for Reducing Costs:

- The least expensive option is to purchase the binder and thickener separately and do mixing of all ingredients on site. The most convenient option is to have a ready-mix, ready-to-use product supplied.
- It is not possible to only mix the binder, thickener and flux and just add the water on site. Without the water, the flux/ thickener/ binder mixture forms a rubbery-like substance that is very difficult to work with.

August 20th, 2003

Updates: July 5th, 2006, November 26th, 2010, June 15th, 2011, and May 28th, 2013*

* Disclaimer:

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