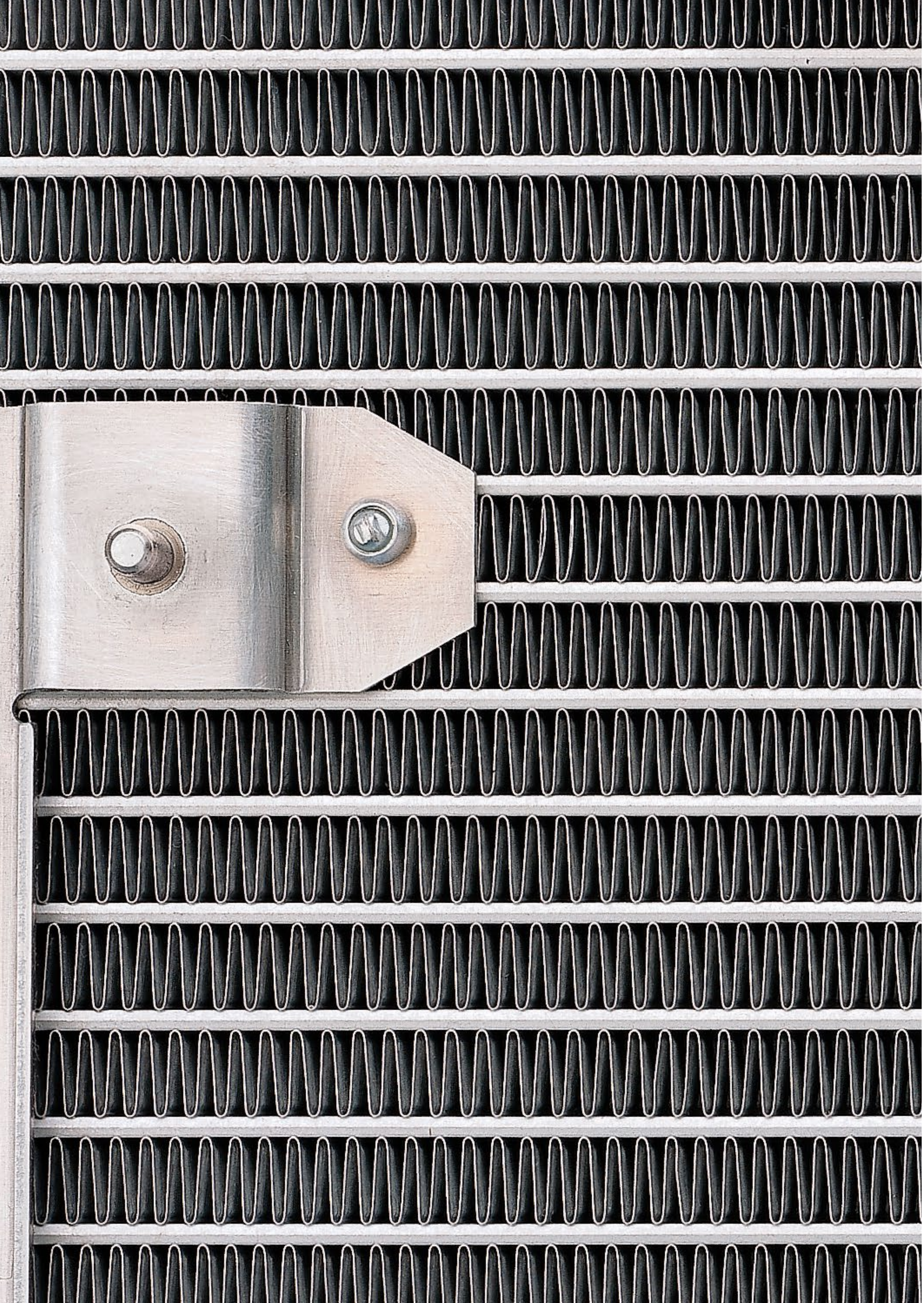


SOLVAY

asking more from chemistry®

NOCOLOK®

NOCOLOK® Li Flux

New Brazing Flux with Improved Residue Performance

Improved Residue Performance

Controlled Atmosphere Brazing (CAB) with potassium fluoroaluminate fluxes continues to be a worldwide standard technology used for the production of all-aluminium heat exchangers. It has been demonstrated, by means of corrosion testing methods (e.g., SWAAT; CASS, NSS), that a residual flux layer improves the corrosion resistance when compared with bare parts[1]).

However, under certain laboratory conditions the exposure of brazed aluminium substrates to low flow rate (stationary) aqueous media over an extended period of time can potentially lead to specific surface reactions[2]). The main factors involved in such interactions are flux residue solubility and dissolution.

To address this issue, Solvay Fluor has developed a new NOCOLOK® composition with improved flux residue performance. When using the new flux, potential surface interactions of brazed aluminium with water are significantly reduced.

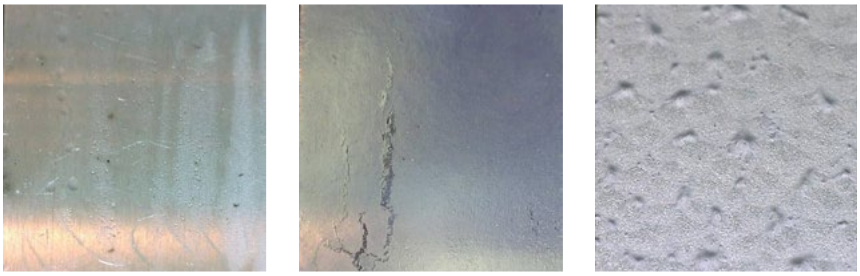
The new NOCOLOK® Li Flux shows the same outstanding properties and brazing performance of standard potassium fluoroaluminate flux – with further enhancement of the post braze flux residue characteristics.

Test 1 Brazing

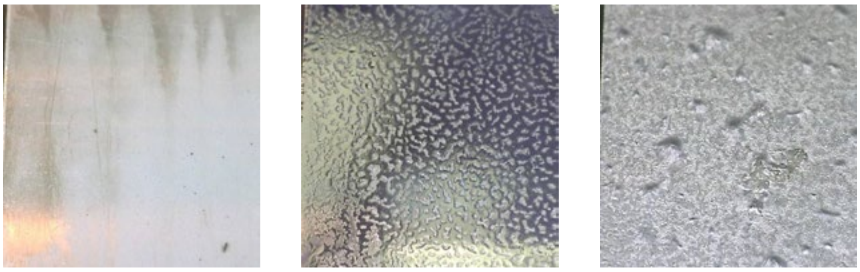
Clad aluminium coupons (3003/4343) brazed with NOCOLOK® Flux and NOCOLOK® Li Flux.

Heating up (569 °C) | Dwelling (605 °C) | Freezing (540 °C)

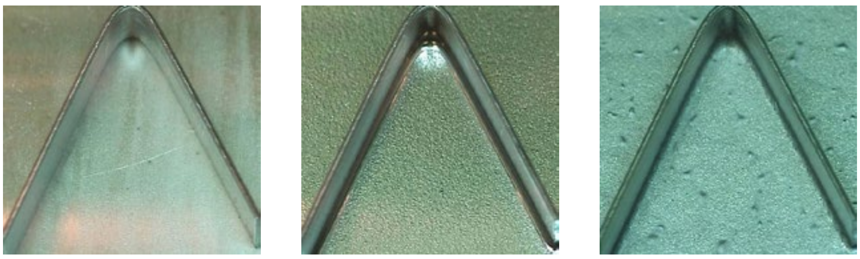
Coupons without angle, NOCOLOK® Flux 10g/m²



Coupons without angle, NOCOLOK® Li Flux 10g/m²



Coupons with angle, NOCOLOK® Flux 10g/m²



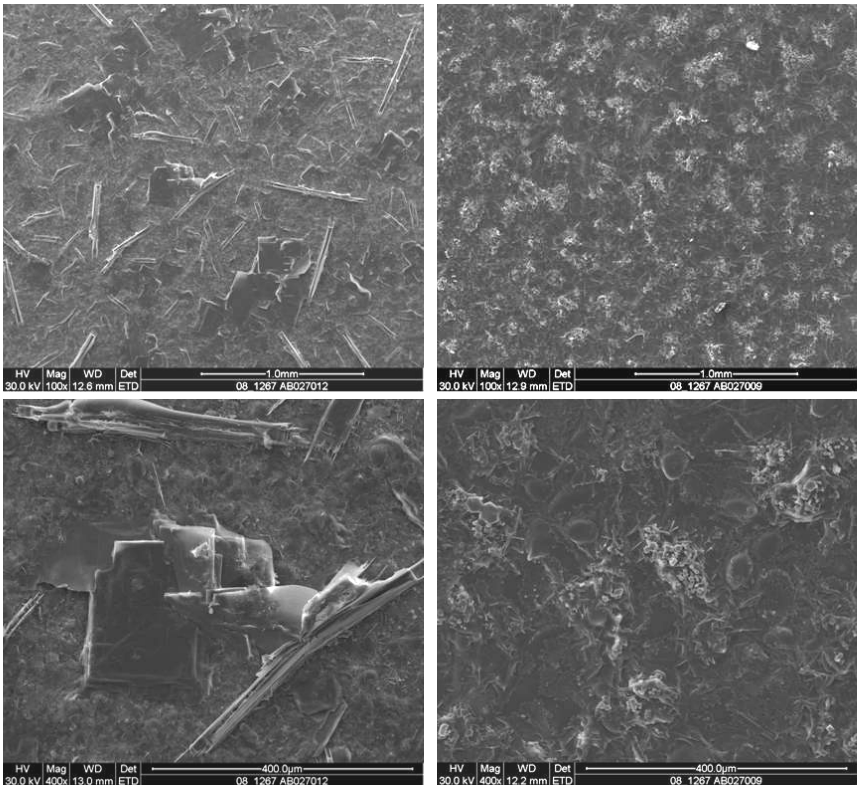
Coupons with angle, NOCOLOK® Li Flux 10g/m²

Notice that the breakup of the oxide layer at 605 °C seems to be more efficient with NOCOLOK® Li Flux.

[1]) *"Influence of Residual Flux Level on the Corrosion behavior of CAB Alloys." A. Gray et. al. International Aluminium Brazing Congress, Dusseldorf; 2002.*
[2]) *"Study on the Hydrolysis of Post-Braze Flux Residues" P.García and H. Swidersky. 13th Invitational International Aluminum Brazing Seminar, Novi; 2008.*

Test 2 Post-Braze Flux Residue Morphology

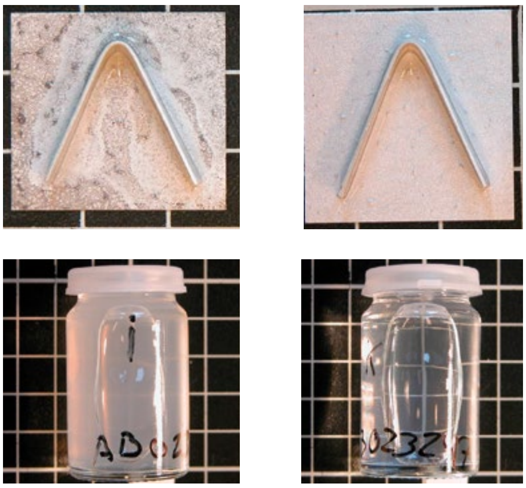
SEM micrographs of clad aluminium coupons (3003/4343) brazed with 5g/m²:
NOCOLOK® Flux NOCOLOK® Li Flux



Test 3 Soaking in Water

Soaking tests carried out with de-ionized water show the improvement of post-braze surface integrety. This can be seen in form of a white precipitate suspended in the test water due to the presence of aluminium hydroxide.

Angle-on-Coupons brazed with flux, after 20 days kept in de-ionized water.
NOCOLOK® Flux NOCOLOK® Li Flux



The chemical analyses of the resulting aqueous suspension confirm the lower concentration of flux residue and corrosion products.

	F (ppm)	K (ppm)	Al (ppm)
NOCOLOK® Flux	586	1186	1221
NOCOLOK® Li Flux	41	423	65

Table 1: Element analyses of water suspension from soaking tests.

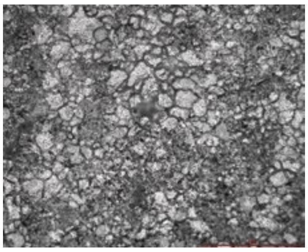
Test 4 SWAAT

	Mass Loss %	Pit Max. Depth µm	Pit Number Mean Value
Without Flux	9	340	19
NOCOLOK® Flux	5	210	4
NOCOLOK® Li Flux	3.5	165	3

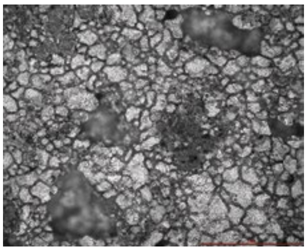
Table 2: SWAAT after 288 h.

High contrast microscope photographs (magnification 50 times) of aluminium coupons (3003/4343 clad) – after standard brazing cyle and 288h SWAAT:

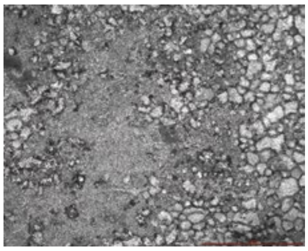
Coupon sample brazed without Flux



with NOCOLOK® Flux



with NOCOLOK® Li Flux



The aluminum coupons (AA3003 with 4343 clad) were fluxed with loads ranging from 3 to 7 g/m^2. All samples were subjected to a standard cycle under CAB conditions with maximum temperature at 600 °C. The coupons were placed in the furnace without an aluminum angle. After cooling, they were collected, weighted and placed in the SWAAT chamber for a test with an acetic acid/sodium chloride solution.

Immediately after removing the samples from the corrosion chamber, they were cleaned first by gently brushing the surface under cold running water to remove the bulk of the salts and corrosion products. The samples were then immersed in cold concentrated nitric acid (70 %) for 30 minutes, followed by another cold water rinse and then air dried. Nitric acid dissolved the corrosion products without attacking the metal.

The pit depth was calculated by microscope method (i.e. measuring the difference of focus-plane from coupon surface to the bottom of the pit).

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