

HOW TO OVERCOME BLOOMING IN INSTANT BONDING ADHESIVES

SOLUTIONS TO *IMPROVE AESTHETICS* IN CYANOACRYLATE BONDING





THE BEST WAY TO SOLVE A BLOOMING PROBLEM

is to understand the root cause

BENEFIT FROM OUR EXPERTISE

Our experience over decades in adhesive technology development has enabled us to provide new solutions for evolving bonding challenges. Our teams with their unique combination of technology and application expertise have the know-how to recommend the best adhesive solutions to meet both the performance and appearance requirements of any application.

BLOOMING IN CYANOACRYLATES

In this eBook we will discuss the phenomenon of blooming which is unique to cyanoacrylate adhesives (CAs). It manifests as a white haze or rainbow haze surrounding the adhesive bond line. It can be a nuisance that detracts from the visual appearance of bonded parts. The great news is that there are many ways to mitigate the effect of blooming.

READ ON TO LEARN MORE!

SUMMARY



CHAPTER 01

What is Blooming?



CHAPTER 02

How to deal with blooming?



CHAPTER 03

How to choose the best solution?



CHAPTER 03

Case Studies

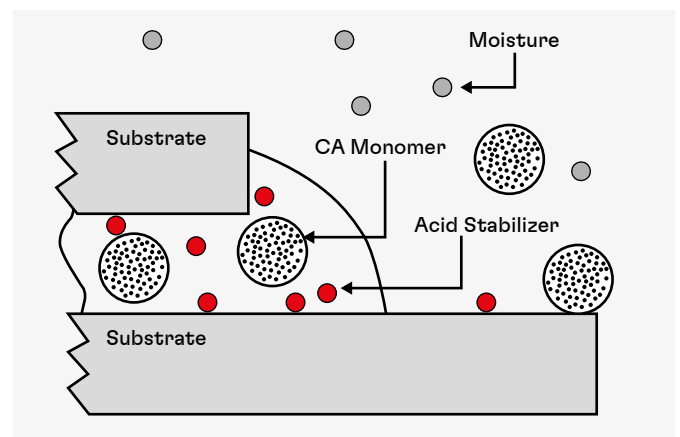
WHAT IS BLOOMING?

Blooming or Frosting is a phenomenon that is unique to cyanoacrylate adhesives (CAs). It manifests as a white haze or rainbow haze surrounding the adhesive bond line. While it does not affect the performance of the adhesive joint, it can detract from the visual appearance of bonded parts.



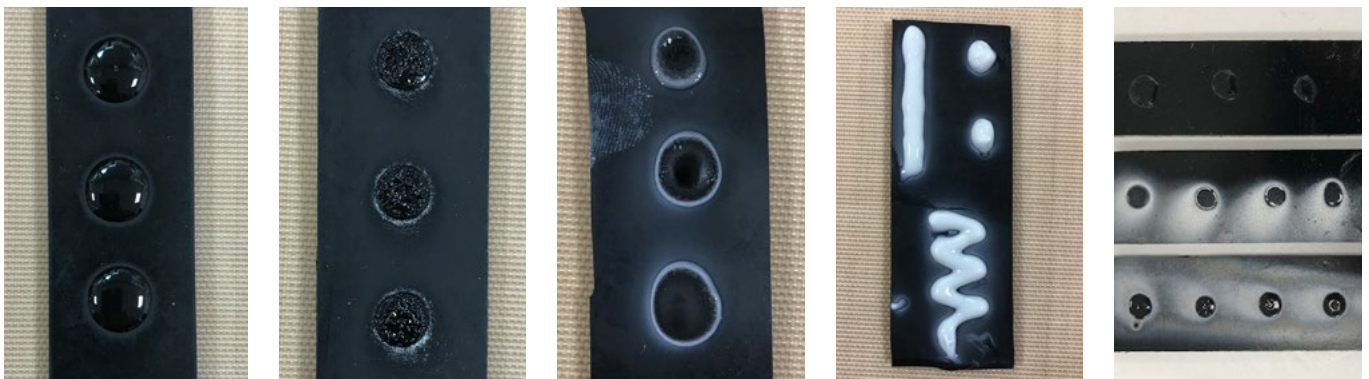
How Blooming Occurs

Between two bonded parts (substrates), some unreacted CA molecules can leave the surface and become airborne. These unreacted molecules are heavier than air and tend to fall back to the surface of the substrate. They react with surface moisture and adhere to the substrate outside the bondline.



What blooming looks like

When blooming is visible as a rainbow haze, this is due to a small concentration of cyanoacrylate particles on the surface. Light hitting the surface is diffracted, causing a rainbow effect. A whitish haze is the result of a higher concentration of cyanoacrylate molecules. Blooming has no effect on bond integrity, it is solely a visual annoyance.



HOW TO DEAL WITH BLOOMING?

If aesthetics are important, blooming can be undesirable. The great news is that there are several ways to mitigate the effect of blooming on bonded parts or to eliminate it entirely.



01

Use Low Odor/ Low Bloom Products

Henkel have a range of CA products which have consist of heavier cyanoacrylate molecules with less tendency to become airborne. They are available in a range of viscosities - Loctite 403, Loctite 408 and Loctite 460.



02

Avoid Large Fillets

A fillet is where adhesive from the bond line is exposed to open air. With more adhesive exposed to open air, the chance of airborne CA molecules is increased. Attempts should be made to keep the adhesive within the bondline.

03

Use UV-CA Products

Henkel have a range of light curing CA products which can cure in seconds in the presence of UV light. This helps prevent cyanoacrylate molecules becoming airborne which can result in blooming.



04

Increase Air Flow

Cross ventilation is useful in carrying any airborne CA molecules away from the bond area. Avoid assembling parts and immediately placing them in an airtight environment such as a bag or shipping container.

05

Use Post-Assembly Activators

An activator used on the bonded parts can accelerate any exposed adhesive to full cure, preventing uncured CA molecules from becoming airborne.



HOW TO DEAL WITH BLOOMING?

06

Avoid Acidic Surfaces

Acidic surfaces slow down the CA cure mechanism, thus keeping the adhesive uncured for longer - increasing the time for CA molecules to become airborne. In the event of such a surface, either rinse to reduce acidity or choose a product and/or accelerator designed for such substrates (i.e. Surface Insensitive Products).

07

Avoid Extremes in Relative Humidity

A relative humidity (RH) of 40 - 80% is recommended for optimum bonding. For example, if RH in the bonding environment is too low, the adhesive will remain uncured longer - increasing the time for CA molecules to become airborne.

08

Avoid Extremes in Temperature

Elevated temperatures will drive off unreacted monomer from within the adhesive causing a blooming effect.

09

Avoid Vacuum Environments

A vacuum environment will pull unreacted monomer from within the adhesive.

10

Avoid the Use of Old Material

Old product does not cure as quickly as fresh material. Be sure to use product prior to its use by date as indicated on the package.

WHAT IS THE BEST SOLUTION?

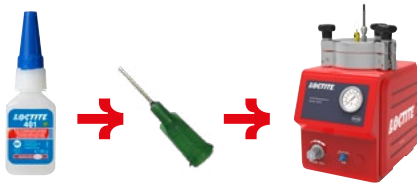
How to choose the most suitable non-blooming solution?



The best solution to avoid Blooming depends on the root cause of the issue. Our Technical team can support you in testing your application and tailoring the approach for your individual needs. Below are 3 recommendations to consider...

Use equipment to improve dosing accuracy with standard products

Because the blooming effect is exacerbated by having excess adhesive when not properly applied, Equipment can help to ensure accurate dispense without waste with reproducible results.



Potentially could be combined with post-application of an activator to accelerate the full cure of the adhesive.



Use low blooming CA products to minimise the problem



Henkel's Low Odour – Low Bloom product range has been specifically developed with heavier molecules with less tendency to become airborne, thus are not prone to blooming.

The product range includes:

LOCTITE 403 - high viscosity
LOCTITE 408 - very low viscosity
LOCTITE 460 - low viscosity

Use UV-CA Products to fully cure in few seconds



UV-curing cyanoacrylate products can reach full cure in a matter of seconds, the ultimate solution to prevent cyanoacrylate release from the bond - achieving 100% transparency and immediate curing application.

The product range includes:

LOCTITE 4304
LOCTITE 4305
LOCTITE 4310
LOCTITE 4311

BLOOMING *CASE STUDIES*



Case Study 1

Reviewing the production process to identify the source of the blooming issue



BACKGROUND

Our customer needed to serve some customers in a shorter time. They were packing their premium devices into a plastic bag **before the 24h full curing time of the adhesives**. Unfortunately, blooming was occurring, causing unacceptable aesthetic issues.



CUSTOMER IMPACT

Cost and time was impacted with extra cleaning, device scrap and even warranty cost (Up to 200€/device). But more importantly the **reputation of their brand** was affected by end user's complaints.



RESOLVING THE ISSUE

A full review of the application process was undertaken with our local Application Engineering team. We **adjusted the application with needles** to improve the **application geometry** and the **dosage amount** to better control the blooming effect



OUR ADDED VALUE

The response of our local AE team with their application and product expertise allowed us to solve the issue but also permitted the customer **to keep the current grade in use**, avoiding the cost and time of validating a new product

KEY LEARNINGS

Changing the process is not a trivial matter

CAs need to outgas in a large volume of air, with good ventilation. Otherwise, uncured cyanoacrylate particles can redeposit more easily on the bonding area causing blooming.

Before questioning the product, examine the application first

The customer's first reaction was to consider testing other products (including competing products) but a rethink of the assembly process led to success.

Collaboration is key

It was by moving around the production line and noticing that certain devices were being packaged more quickly than others that the root cause of the blooming issue was identified.

Keeping the current product solution was a must. Proximity of the Henkel team to the customer was key for success!

Case Study 2

Automation to improve bond quality and eliminate the blooming effect



BACKGROUND

A start up company manufacturing high end stands for tablets was facing **unpredictable results due to bondline variation and cosmetic issues** due to blooming. Inconsistent product dosage affected assembly strength when too low and caused blooming when too high.



CUSTOMER IMPACT

Additional cleaning added cost and time. When the drop test was not successful, they were required to reapply the product or to scrap part of the production.



RESOLVING THE ISSUE

The application was reconsidered completely with local Henkel experts. A rubber toughened adhesive was recommended to withstand the drop test requirement. A digital syringe system was implemented to provide consistent application volumes and an additional ventilation was recommended to eliminate the blooming issue.



OUR ADDED VALUE

Failure rate was reduced to nearly 0. Testing confirmed that the previous surface preparation was not required anymore, and the assembly process was reduced by one step.

KEY LEARNINGS

A combination of solutions

Precise application, a better suited adhesive and additional ventilation were the right combination to resolve the customer's issues.

Solutions exist to reduce blooming effect even for standard adhesives

Even though Loctite 410 is not a low blooming adhesive grade, solutions were found to resolve the blooming effect.

Automation as a pillar to ensure the right quality

Automation is not only helping to improve production efficiency but to ensure the correct dosage and improve the quality of the application.

Applying the right amount of adhesive is key to ensure that the performance requirement is met and simultaneously that blooming is eliminated.

Case Study 3

Post-application of activator to ensure full transparency of the adhesive



BACKGROUND

A customer was not able to control blooming on a plastic bonding application when using a Loctite CA adhesive. The plastic acrylic was required to remain completely clear on their product.



CUSTOMER IMPACT

Cost, time and waste. Customer was dissatisfied with the adhesive batches when blooming appeared. The affected parts were too difficult to clean, resulting in scrapping of **most of their non-acceptable products**.



RESOLVING THE ISSUE

As recommended by the Henkel application engineer, after application of the adhesive, a rapid wiping step with an activator around the bond allows the CA to cure rapidly and eliminates the blooming issue.



OUR ADDED VALUE

This extra activating step helped to control the blooming effect to reach almost 0% scrap. This represented a saving **of 25% on the waste cost** and significantly helped to improve the processing time.

KEY LEARNINGS

Preventing the evaporation of the CA

Blooming results from the redeposition of uncured airborne cyanoacrylate on the bonding surface. One way to prevent blooming is to accelerate the cure, avoiding uncured CA being released into the air. This was achieved using an activator.

Before questioning the product, examine the application first

Understanding the reasons behind blooming allowed the Henkel team to address the issue with a simple fix and without changing the CA product used.

Improved reliability

The solution to the blooming issue improved the quality and reliability of the application, resulting in customer satisfaction!

Even though the manufacturer needed to add an extra process step, this was largely compensated by the reduction in scrap.



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