Advantages of DOWSIL™ 3055 Resin:

- Improves flexibility and wet adhesion
- The silicone structure provides improved thermal, acid, UV and moisture performance
- Low-VOC formulating
- Cure chemistry eliminates mass loss, stress cracking and post-cure drift
- Good compatibility with other Si and organic resins

Low-Voc, Liquid, Amine-Functional Siloxane Crosslinking Resin

Amine-functional polymers have had broad utility in the coatings industry for nearly a century. Second only to the composite wood industry, the coatings industry employs amine resins in the synthesis or curing of nearly every paint resin binder system, including urethane, epoxy, polyester, alkyd and acrylic systems. DOWSIL™ 3055 Resin offers a distinct option from the traditional organic amine polymers. Used as the sole amine source, or in combination with organic amine crosslinkers, DOWSIL™ 3055 Resin provides the benefits of siloxane chemistry: flexibility, thermal and UV durability along with acid and water resistance. And with < 1% residual solvent, DOWSIL™ 3055 Resin allows formulating of low-VOC, high performance coatings. Particular attention has been given in this document to the modification of epoxy resins; however, with the active amine functionality, DOWSIL™ 3055 Resin can also be used for any high-performance coatings based on Urethane, Carboxy functional Polyester, Alkyd and Acrylate resins.

The Next Generation of Silicon-Based Hybrids

Traditional polysiloxane hybrids rely on alkoxy-functional materials, such as silane monomers to crosslink organic polymers via organic reactivity and a secondary cure mechanism of hydrolysis and condensation of alkoxy groups (see Figure 1).
**Figure 1.** Cure Mechanism of Silane-based Polysiloxane Coatings

Epoxy Resin + Amino Silane + Silicone Resin

\[ \begin{align*}
\text{Epoxy Resin} + \text{Amino Silane} + \text{Silicone Resin} & \rightarrow \text{Silane-Based Polysiloxane} \\
\text{H}_2\text{O, Sn, Ti} & \rightarrow \text{Silane-Based Polysiloxane} \\
\end{align*} \]

[Diagram of cure mechanism]

DOWSIL™ 3055 Resin simplifies the chemistry (see Figure 2). Essentially all silylalkoxy groups are eliminated. Only amine functionality remains to participate in the crosslinking and curing of the coating. This elegant technology eliminates the need for catalysts (titanate for hydrolysis and tin for condensation), along with the reliance on ambient moisture. Further DOWSIL™ 3055 Resin eliminates the generation of volatile by-products, which contribute to VOCs, mass loss and post-cure embrittlement.

**Figure 2.** Cure Chemistry of DOWSIL™ 3055 Resin

Epoxy Resin + DOWSIL™ 3055 Resin

\[ \text{Epoxy Resin} + \text{DOWSIL™ 3055 Resin} \rightarrow \text{Silicone Epoxy Hybrid} \]

DOWSIL™ 3055 Resin generates no alcohol by-product → low VOC, no mass loss, no post-cure drift.

**Differentiated Performance with DOWSIL™ 3055 Resin in Combination with Epoxy Resins**

Used alone or in combination with organic amine crosslinkers, DOWSIL™ 3055 Resin improves the physical properties and long term performance of the epoxy coatings. For example, wet adhesion of the epoxy formulation improved with only 6% DOWSIL™ 3055 Resin addition. Other performance also starts to improve at as low as 6% DOWSIL™ 3055 Resin in formulation. At higher usage level (30-60%), DOWSIL™ 3055 Resin can meet the harsh requirements needed for specialty applications.

**1. Flexibility**

Mandrel flexibility of Bis-A and Bis-F epoxies improves with DOWSIL™ 3055 Resin at addition levels as low as 6%.

**Figure 3.** Improved Mandrel Flexibility of the Epoxy Coating with Addition of DOWSIL™ 3055 Resin

**2. Thermal Stability**

Graph 1 shows the improved thermal stability provided by varied levels of DOWSIL™ 3055 Resin. Similar results were obtained with Bis-F, Novolac and Cycloaliphatic epoxies.

**Graph 1.** Bis-A Epoxy with DOWSIL™ 3055 Resin and Organic Polyamine

[Graph showing percent mass retention over hours at 175°C and 230°C for different percentages of DOWSIL™ 3055 Resin]
Potential DOWSIL™ 3055 Resin Applications

- Industrial/protective coatings
- Primer
- Metal containers
- Coil coatings
- Wood and metal furniture
- Prefinished wood
- Appliances
- Machinery and equipment
- Electrical insulation
- Automotive
- Land transportation
- General metal and miscellaneous OEM

Because it imparts improved thermal, weathering and chemical resistance properties, DOWSIL™ 3055 Resin also offers potential opportunities for performance improvement in applications outside of traditional protective coatings, including fire-resistant and intumescent coatings, composite polymers, industrial adhesives, and high-temperature coatings.

3. Acid Resistance

Acid resistance is improved in Bis-A, Bis-F, Novolac and Cycloaliphatic epoxy resins with the inclusion of DOWSIL™ 3055 Resin starting at 24% in the formulation.

Figure 4. Improved Chemical Resistance of an Epoxy Coating Formulated with DOWSIL™ 3055 Resin

4. Water Absorption

Water absorption of the epoxy coating decreases with higher use of DOWSIL™ 3055 Resin.

Chart 2. Bis-A Epoxy with DOWSIL™ 3055 Resin and Organic Amine

Additional Product Information

Table 1. Properties of DOWSIL™ 3055 Resin

Table 2. Example Formulations

DOWSIL™ 3055 Resin may be blended with other Si resins or organic resins to customize performance.
More Than Resins

Our innovative, silicon-based resin and additive technologies can help you infuse your products with high-value performance attributes that will give you a competitive advantage in the marketplace. As a leader and innovator with a long history of success in the industry, Dow’s performance-enhancing coating technology platforms are well-aligned to the needs of the increasingly competitive global coatings market. Consider what adding the following enabling technologies could do to improve your products’ performance and support your business goals:

- Gloss enhancement
- Mar resistance and slip
- Impact deadening
- UV resistance
- Feel and touch
- Anti-fouling
- Water resistance
- Heat and temperature resistance

For More Information

Visit consumer.dow.com to learn how Dow’s innovative coatings technology platforms can help you power up your product line. A complete list of phone numbers can be found at consumer.dow.com/contactus.