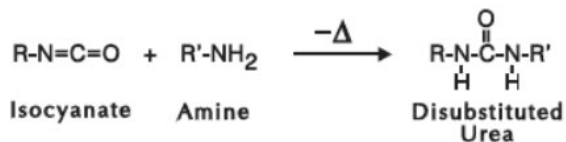
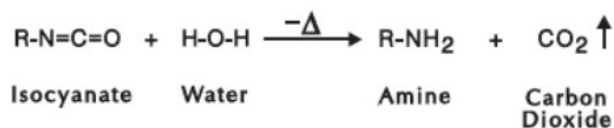


Moisture Contamination of Polyurethanes

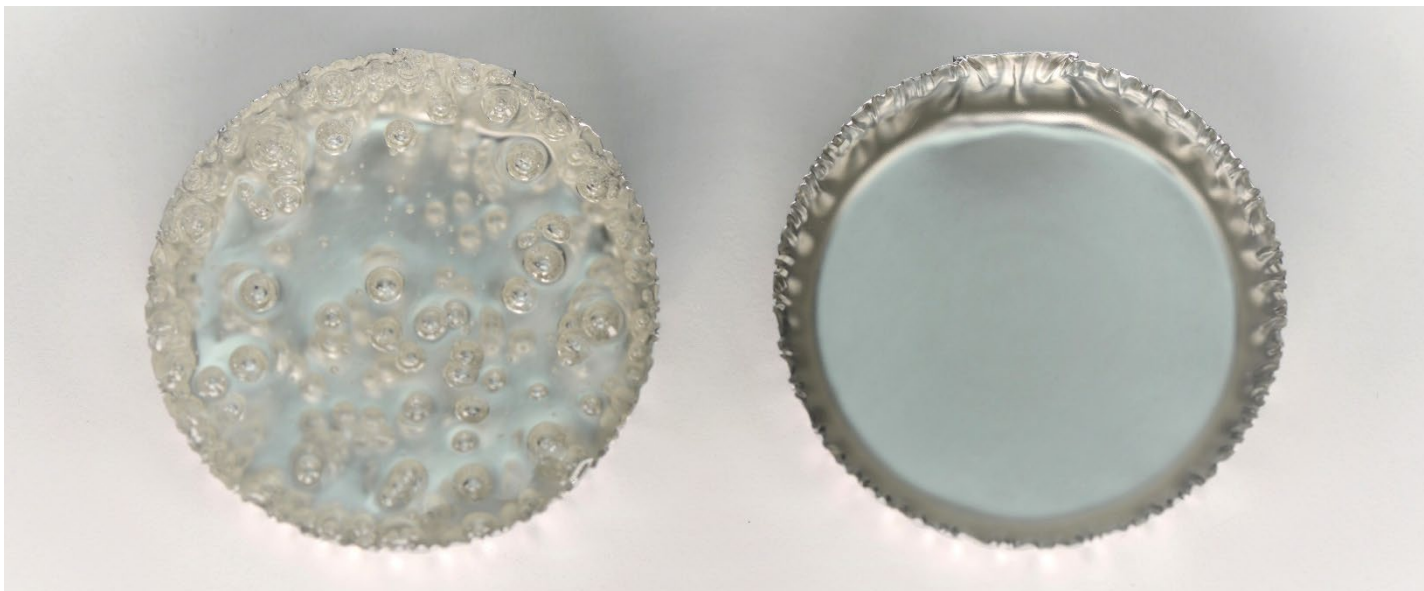
Polyurethanes are made by reacting polyols with isocyanates. Both materials are hygroscopic and will absorb moisture from the atmosphere. When isocyanates encounter water, whether directly from the atmosphere or from moisture brought in during the mixing with a polyol, they react to form carbon dioxide and amines, which then react with the isocyanate to form polyurea linkages.



What Does Moisture Contamination Look Like?

The carbon dioxide gas creates bubbles in the final cured material and can lead to foam generation if the water content is high enough. For polyurethanes being used as adhesives or encapsulants, moisture contamination negatively impacts the final product properties because of this bubble formation.

Formulators commonly incorporate drying aids into the polyol side of formulations to scavenge moisture and formulations are commonly made with excess isocyanate to account for any loss of isocyanate due to reaction with water. The formulator's choice of isocyanate also has a large impact on how reactive the isocyanate is with water. Aliphatic isocyanates are less reactive with water and are less prone to the formation of carbon dioxide during the curing process.



Avoiding Moisture Contamination

Moisture contaminated isocyanates may appear cloudy, may contain solid material at the bottom of the container, or may form a solid layer over the top of the isocyanate in a container. Generally, there is no visual difference between a contaminated and uncontaminated polyol. If a container with isocyanate is opened and only partially used, a nitrogen head should be applied to the container before closing it again. This is also a best practice for polyols.

When working with meter mix equipment it is best to have a low-pressure source of nitrogen providing a continuous nitrogen head to materials. Alternatively, meter mix equipment can be equipped with desiccant cartridges to prevent exposure to moist air.

How ResinLab Prevents Moisture Contamination

ResinLab takes several proactive steps to prevent moisture contamination of its polyurethane products. These protective steps are found in all stages of the formulation process including: raw material handling, formula creation, processing, and packaging of the finished product.

Raw Material Handling

- Incoming raw materials are evaluated for moisture content with a Computrac Vapor Pro XL moisture analyzer.
- The headspace of raw material pails and drums are purged with dry nitrogen to prevent moisture ingress during storage.

Formulation

- Moisture scavengers are incorporated into the formulas to eliminate any absorbed moisture.
- Isocyanates are judiciously selected to limit potential moisture issues when possible.
- Catalyst selection can also reduce the risk bubbles being formed when curing a polyurethane.

Processing

- Fillers are oven dried before incorporation into production batches of polyurethanes.
- Batches are mixed under vacuum or under a nitrogen blanket during processing.

Packaging

- Nitrogen is used during the packaging process to prevent moisture contamination.
- Cartridges are packaged in moisture proof foil bags with desiccant packs to protect the product from moisture contamination during shipping and storage.

For more information about our lab capabilities and other services, contact us today.