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Hydrolysis: What You Need to Know

What is Hydrolysis?

Hydrolysis is the chemical breakdown and degradation of polymers (depolymerization) due to extended exposure to humidity and heat.

What is Hydrolysis Resistance?

Hydrolysis resistance is the ability to withstand exposure to extended periods of humidity and heat.





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What types of fabrics are susceptible to Hydrolysis Failure?

Polyurethane coated fabrics, because of their inherent polymer chemistry can be vulnerable to humidity and heat (including body heat transferred while sitting). For this reason, the ACT Voluntary Performance Guidelines include hydrolysis resistance testing for all polyurethane coated fabrics.

Note: Hydrolysis does not affect PVC based fabrics therefore, this information does not pertain to PVC based fabrics with polyurethane topcoats.

The level of a polyurethane coated fabric's hydrolysis resistance can vary with its content and manufacturing.

Polymers, synthetic carbon-based materials, are the building blocks of polyurethane resins. There are three types of polyurethane resins with different degrees of hydrolysis resistance.

Types of Resins

Polycarbonate

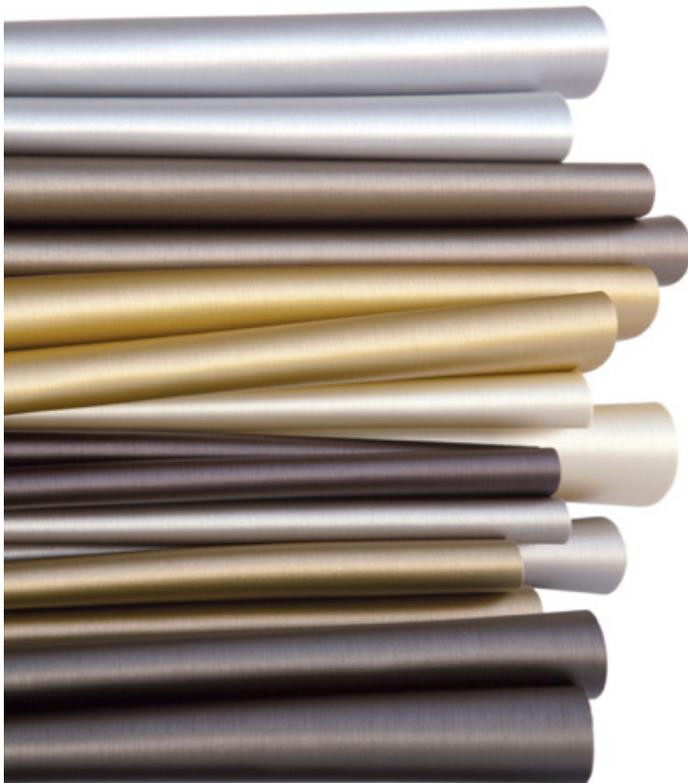
- Highest resistance to humidity & heat
- Highest cost: \$\$\$

Polyether

- Good resistance to humidity & heat
- Mid-range cost: \$\$

Polyester

- Least resistance to humidity & heat
- Lowest cost: \$



The majority of polyurethane upholstery materials are a blend of the above resins, and the hydrolysis resistance is determined by the specific blend.

Polyurethanes can also be combined with other materials (e.g., silicone), and a hybrid composition can impact the coated fabric's hydrolysis resistance.

Because manufacturing processes may also affect the hydrolysis resistance, it is important to determine hydrolysis test results in addition to understanding the chemical content.



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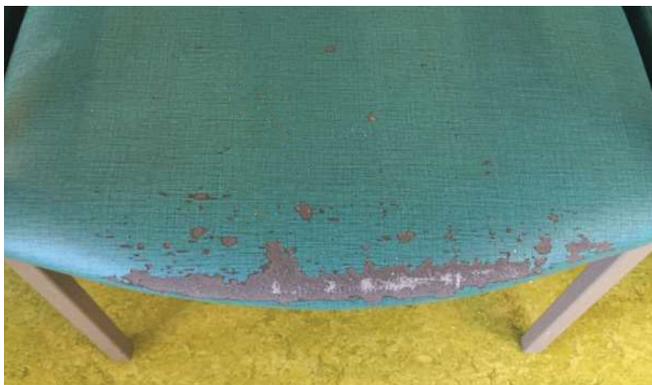
What does Hydrolysis Failure look like?

When a polyurethane coated fabric fails due to hydrolysis, the film of the material can crack, flake off or delaminate. Hydrolysis failures do not typically occur in a single localized section of the furniture or only on one piece in a room. Failures tend to be widespread and can affect all seating in a location similarly.

Field failures of polyurethane coated fabrics are not necessarily due to hydrolysis: they can also be caused by improper or excessive exposure to cleaners, sanitizers, and/or disinfectants. These chemical products can also cause flaking and/or cracking (depolymerization) that look similar to hydrolysis failures.

To minimize the risk of these failures, it is essential to use these cleaning/sanitizing/disinfecting products in adherence with the chemical manufacturer's and fabric supplier's instructions.

As with all fabrics, it is important to determine a fabric's compatibility with specific cleaners, sanitizers and/or disinfectants that will be used in the facility. See ACT Test Method 1-2020.





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What is the method for testing Hydrolysis Resistance?

There are several different test methodologies to test for hydrolysis resistance. ACT recommends the ISO 1419 test with a 5-week minimum test length.

ISO 1419 (Tropical Test Method C) is a test method of the International Organization for Standardization. Fabric specimens are placed in an oven that is heated to 70° C (158° F). The oven must also have at least 95% relative humidity and expose the specimens to free passage of air on both sides. Test pieces are removed from the oven weekly and visually evaluated for cracking, flaking or delamination. The rating is determined by the number of weeks the fabric passes this evaluation. Note that there is no direct correlation of testing weeks to years of service in the field. ACT Guideline: 5 weeks minimum.

This test is colloquially referred to as the jungle test. Conventionally, the results have been stated in years rather than weeks, but ACT recommends referring to the results in weeks so as not to imply a warranty with regard to years of service.

What Hydrolysis Test Results should I be looking for?

For general indoor contract upholstery applications, the ACT Voluntary Performance Guideline for Hydrolysis Resistance calls for 5 weeks minimum. There may be environments in which materials with higher hydrolysis resistance are beneficial, such as in sunrooms or indoor pools with particularly high heat or humidity. Higher hydrolysis resistance has also been shown to be helpful when selecting appropriate coated fabrics for areas with frequent exposure to cleaning, sanitizing and disinfecting chemicals.



For most indoor end-use applications, the 5-week exposure recommended by the Association for Contract Textiles is sufficient.