



Ammonia fuming gives hardwood floors a rich, distinctive appearance through chemical reaction with the wood's tannins.

Image Source: Flickr user Brett Jordan

Last year I spent hours wandering through hardwood floor stores, carefully inspecting row after row of wood types, grains, and colors. The choice of hues was virtually endless, ranging from the palest of whites to the darkest ebonies, and with the help of a few enthusiastic salespeople, I quickly learned the basics of hardwood floor manufacturing, from wood species to cuts to how each flooring type acquires its color. Amongst the rainbow of options, there was one that stood out and whose color is derived from a process that sharply diverges from the vast majority of flooring options: ammonia fumed oak. Created via chemical reaction to ammonia, the finished boards have a unique appearance that can never quite be matched by typical staining and have several practical advantages over more standard coloration methods. However, the ammonia fuming process itself can be vulnerable to inconsistency and have different effects on woods from different trees and even boards from the same tree. To evaluate the impact of ammonia fuming and refine fuming processes, spectrophotometric analysis can be an invaluable tool for [manufacturers of these distinctive flooring products](#).



Traditional staining of hardwood floors can create a beautiful appearance and give consumers a wide variety of color choices, but also comes with several drawbacks.

Image Source: Pexels user Breather

The Advantages of Ammonia Fuming

Hardwood flooring has traditionally received its final color using a variety of staining products that use pigments and dyes that cover the surface with a translucent coating of color and give homeowners a broad spectrum of options to create the look they want. Despite the versatility of staining, this coloration process has a number of disadvantages, including vulnerability to blotching, color loss over time, and potentially obscuring the grain of the wood. The staining process itself requires careful preparation to ensure an even appearance and protect against accentuation of imperfections. What's more, because the stain primarily sits on top of the wood and does not penetrate deep into the material, scratches and scrapes can easily reveal the natural color of the wood beneath the surface, creating an unattractive and worn appearance.

In contrast to staining, ammonia fuming is not simply a superficial coloration method, but a deep-penetrating chemical reaction. As noted by researchers Petr Čermák and Aleš Dejmál, "Changes in color are due to the reaction of ammonia with tannin in the wood and atmospheric oxygen."¹ Commercial fuming takes place in a sealed chamber in which the wood is exposed to an ammonium hydroxide solution that darkens the wood, reaching as deeply as 1" on the end grain and between 1/16" and 1/8" on the face grain."² As a result, the wood may be cut and lightly sanded or planed following fuming and normal wear and tear, scratches, and scrapes are far less likely to reveal untreated wood, preserving a pleasing aesthetic appearance. Additionally, the fuming process allows the natural wood grain to show because it is not covered by a layer of dye or pigment. The final result is a distinctive, durable flooring product with a character and beauty many consumers prefer.



Spectrophotometric monitoring of ammonia fuming allows for increased color consistency between boards from different trees.

Image Source: Unsplash user Wendy Garner

Spectrophotometric Evaluation of Ammonia Fuming

While the ammonia fuming process corrects for many of the problems associated with wood staining, it can have its own drawbacks. Most notably, ammonia may react to different boards in different and unpredictable ways, creating an inconsistent appearance. While many consumers prize this variation and see it as part of the inherent charm of fumed hardwood floors, increasing consistency both within a batch and between batches allows manufacturers the opportunity to create more harmonious products and gives contractors the ability to more accurately match boards for replacement at a later date.

Spectrophotometers are uniquely suited to evaluate hardwood floor color owing to their advanced colorimetric technologies. Instruments with [integrated height measurement](#) automatically compensate for height variation to obtain accurate color measurements of textured surfaces and can easily account for grain, knots, and handscraping. Simultaneously, [color averaging](#) gives operators the ability to precisely capture color information despite naturally occurring color variation within each board. As such, virtually all research into the color effects of ammonia fuming uses spectrophotometric instrumentation to quantify color and correlate color change with variables such as duration of treatment, temperature, and extractive, nitrogen, and tannin content.³Incorporating spectrophotometers in the fumed wood production process allows manufacturers to monitor color change during the treatment process to determine when floor boards have reached their desired hue. By eliminating the [subjectivity of the human eye](#), operators can detect the precise point the board enters [the chosen color standard](#) and identify out of spec product. Pairing your spectrophotometer with sophisticated software allows you to evaluate ammonia fuming process variables by creating reliable datasets that may be used to immediately tailor treatment processes as well as archiving historical data for future reference.

HunterLab Quality

HunterLab's commitment to technological excellence has made us a leader in the field of color measurement for over 60 years. Our diverse line-up of instruments includes a comprehensive array of portable, benchtop, and inline spectrophotometers that unites extraordinary accuracy with user-friendly design and the hardiness to stand up to even the most challenging conditions. To maximize the potential of our instrumentation, our [EasyMatch QC software](#) offers extraordinary flexibility to collect, display, and analyze color data, allowing you to create color standards, store an unlimited number of samples, and easily recall job details. This combination of hardware and software gives you the ultimate in color quality control and the ability to precisely modulate your manufacturing practices to meet the demands of your customers. [Contact us](#) for more information about our range of renowned spectrophotometers, software packages, and world-class customer support services.

1. "The Effect of Heat and Ammonia Treatment on Colour Response of Oak Wood (*Quercus robur*) and Comparison of Some Physical and Mechanical Properties," August 12, 2013, http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-221X2013000300010
2. "Fuming With Ammonia," February 2003, <http://www.leevalley.com/en/shopping/techinfo.aspx?p=47277>
3. "Wood Color Changes by Ammonia Fuming," 2012, https://www.ncsu.edu/bioresources/BioRes_07/BioRes_07_3_3767_Miklecic_SJ_Wood_Color_Change_NH3_Fuming_2762.pdf