

THE LOW MOISTURE CARPET CLEANER'S ASSOCIATION



A WHITE PAPER ON CARPET CLEANING CHEMISTRY

By the LMCCA Technical Committee

James (Jim) B Smith, Technical Director and Second Vice President; Lonnie McDonald, President of LMCCA and owner of Leather Pro & Integrity Carpet Cleaning Inc.; Glenn Miller, senior chemist of Scot Laboratories; Mark Warner of Bullen Companies; Jeff Cross, Senior Editor, Cleanfax Magazine; Bill Yeadon, IICRC Instructor & Chairman of the CCT Committee, & Director of Schools for JonDon; Dave Roderick First Vice President LMCCA and Owner of Cleaning Solutions; Gary Heacock of Heacocks Custom Cleaning; Chuck Robbins of Solutions Cleaning; Lee Senter, owner FRESH AND CLEAN CARPET CLEANING; Lee Watson, of Challenger Pad Systems

Introduction: Since its conception, the LMCCA has been involved in dispelling technical inaccuracies and promoting advancements in technology. They have introduced the importance of heat to low moisture methods in the S100 Carpet Cleaning Standard; their industry partners have led the industry with respect to encapsulation. They have bridged the gap in the industry by being involved in the IICRC Certification Council and as one of the associations sponsoring CONNECTIONS. Their president has chaired the Leather Task Force for the IICRC and is the vice-chair of the S300 Upholstery Cleaning Standard. In addition, many of their members have been using pH pens in their daily cleaning. In doing so, they have lead the development of this WHITE PAPER.

Assessment of the Current Issue: The rules for cleaning wool and stain resist nylon carpet are flawed and need revising. In addition, some inaccurate beliefs are held by a large number of cleaners that is contrary to appropriate chemistry. Namely:

- That pH represents the total acidity or alkalinity of a water-based solution.
- If acids and alkalines are equal in strength and or equal distances from neutral, their mixing will always equal a neutral solution.
- If a carpet residue has a pH of 10, then it should be rinsed or treat it with a solution whose pH is 4 in order to neutralize it.

All of these beliefs are technically inaccurate and need to be addressed.

A BRIEF HISTORY OF CHEMISTRY AND THE UNDERSTANDING OF pH, acids, & alkalines.

The first written rules about the pH of shampoo solutions likely came from the BRITISH STANDARD¹ written in the 1950s. Back then, it stated that the pH of shampoo solutions should be between 5.5 to 8.0 for cleaning wool. In those days, ammonium hydroxide was the alkaline of choice. Why this rule had a bottom limit is unknown; wool is washed in sulfuric acid² in the scoring in a process known as 'carbonizing' to remove excessive cellulosic material. The upper limit minimized the amount of ammonium hydroxide since its pH is:

- 1.0 N aq. Solution = 11.6
- 0.1 N aq. Solution = 11.1
- 0.01 N aq. Solution = 10.6

The rule was revised in the United States by Wools of New Zealand in support with the IICRC, changing the range to 4.5 to 8.5.³

¹ The British Standard BS 4088:2001. Revised with no changes in 1968.

² THE WOOL CARPET CLEANER'S MANUAL, by Eric M Brown, section 2.3

³ IICRC Standard for Professional Carpet Cleaning S100, section 7.2.1 Chemical Action

THE LOW MOISTURE CARPET CLEANER'S ASSOCIATION

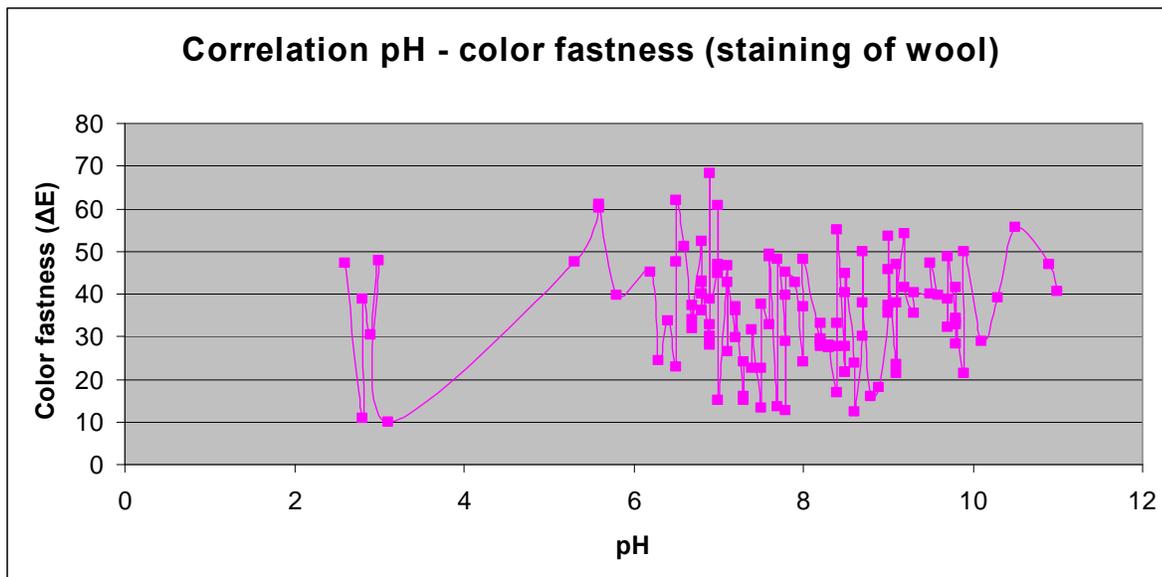


The nylon rule came along with the advent of acid dye blockers. Acid dye blockers are adversely affected by strong alkali solutions. It was quickly discovered that many detergents distorted the acid dye blockers. Rules were developed in cooperation with the IICRC and the makers of stain resist carpet to limit the pH of those products to 10.0⁴. At that time, no one defined whether the pH measurement should be based on the concentrate or the ready to use solution. Most of the makers of these products recommended the RTU interpretation of the rule.

Another guideline was created by the International Wool Secretary in 1994. IWS initially set standards for testing wool products, but was requested by chemical manufacturers to accredited cleaning products. Therefore, a program was created called CAMPES which stood for the Carpet Maintenance Products Evaluation Scheme. Among other things, the total alkalinity instead of pH was measured. Alkalinity is a measure of the pH buffering capacity of water, or how much acid can be added to the solution without causing a significant change in the pH. There is not necessarily a direct correlation between the pH and the alkalinity of a solution. Thus, some products with a pH as low as 6.5 were too well buffered while one product with a pH of 10.5 was acceptable⁵. In 1997, Wools of New Zealand took over the program changing the name to WoolSafe. In October 1998, WOOLSAFE became its own entity.

Awareness that the two schools of thought were not compatible did not occur until late 2003 when the United States director of WoolSafe became aware of it. Wools of New Zealand dropped this pH rule in January 2004 and endorsed the low alkalinity/low buffer recommendation used by WoolSafe. They have not chosen to be involved in the discussion since. WoolSafe then published a study comparing the pH of products intended for use in cleaning wool carpet to colorfastness and also comparing their total alkalinity.

One hundred and fourteen products were tested according to their pH, which varied from 2.6 to 11.0. The results of these tests show a product with a pH of 10.5 passed; many that were between 6.0 and 8.5 did not.



⁴ IICRC CARPET CLEANING STANDARD S001 November 1, 1991

⁵ The WoolSafe Organization <http://www.wool-safe.org/newstext02-04.htm>

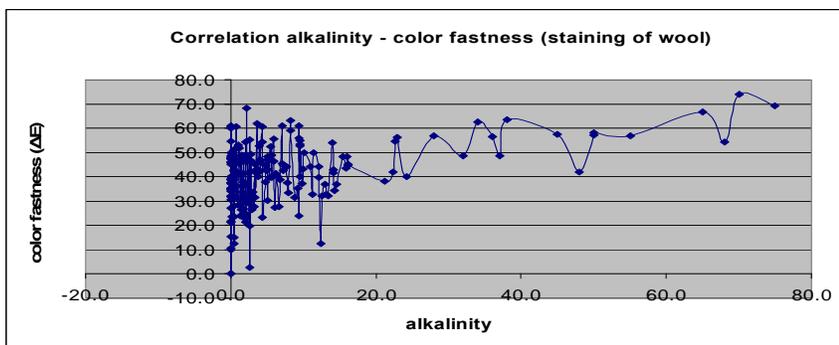
THE LOW MOISTURE CARPET CLEANER'S ASSOCIATION



On the scale above, less than '50' on the colorfastness axis is a "Pass". If there were a direct correlation between pH and colorfastness, then the scale would have a gradual curve going upward from left to right.

In addition, if the pH 4.5 to 8.5 rule had merit, then one would expect pH 4.5 to 8.5 to all be under 50 on the colorfastness axes. Instead, most of this curve shows no direct correlation between pH and colorfastness.

To illustrate the effect of alkalinity versus colorfastness, WoolSafe tested 209 products. All of the 114 products used in the pH test were included. In the graph below, the line is very different and shows a great deal of correlation between alkalinity and colorfastness. Most products that are not buffered passed. Those that are buffered often failed.



Whereas WoolSafe is a 'for profit' testing laboratory and the LOW MOISTURE CARPET CLEANER'S ASSOCIATION is a 'non-profit entity, a need for a 'WHITE PAPER' by non-profit organization is necessary. In addition, the LMCCA Vision Statement & Code of Ethics says:

The LMCCA will also be instrumental at "breaking down the walls" that divide and separate the Industry we love.

Conclusions

Dispelling the technical inaccuracies:

- The 'product pH rule' worked better when volatile ammonium hydroxide was the only alkali used. The alkalis being used today are typically phosphates and silicates. Sodium tripolyphosphate's pH at 1% is between 9.7 and 9.8. Sodium Metasilicate's pH at 1% approaches 14. Both substances are well buffered and leave solid residue that does not evaporate. Under those circumstances, the pH rule is less likely to work.
- The belief that that pH represents the total acidity or alkalinity of a water-base solution is not supported by institutions of higher learning.

The thought that if acids and alkalines of equal strengths and or equal distances from neutral are mixed together will always yield a neutral solution is not true. The LMCCA believes that these technical inaccuracies are an illustration of what happens when intelligent people are not given adequate information to predict the consequences of their actions. Thus, while some would argue that this in-depth teaching of chemistry might confuse technicians, LMCCA would argue the opposite. The typical professional cleaner is intelligent, but in this case misinformed.

Therefore, a time has risen for the LMCCA to say that the pH rules based upon products are flawed and that new rules should be developed that are based upon the fiber.

THE LOW MOISTURE CARPET CLEANER'S ASSOCIATION



The ability to measure the pH of the carpet was not a reality until recently. Affordable pocket size pH pens with flat surfaces have been in the market since 1999. (The EXTECH PH100 is one model that fits that description and sells for about \$100.⁶) With a pH meter, cleaning technicians can know the acidity or alkalinity of the carpet before cleaning. In addition, accurate determination of the right product to use and its concentration can be determined during the cleaning. For example, if upon arriving at a job site, the pH of the carpet is found to 10.0, an acidic detergent should be used in the final step. If the acid detergent only lowers the pH of the carpet to a '9', then a stronger concentration or another product should be used. Other benefits include better assessment of the source of spots. Reference charts that give guidelines for interpreting readings are already being used in Carpet Inspector's Schools. An example of what is used at the Academy of Textile & Flooring is as follows:

AREA	pH	Source	Additional Action
Spot	Less than 3	Strong Acid, toilet bowl cleaner, tile cleaner	Test for Chlorides to determine Hydrochloric Acid
Overall	3 to 6	On new carpet, Acid dye lock	Check Colorfastness at higher pH
Spot	From 3 to 6.0	Food Related	Try spotting with enzymes
Overall	4.0 to 5.5	Acid Rinse	None
Overall	6.0 to 6.7	Typical pH for Soil	Typical pH for Soil indicating no recent cleaning.
Spot	0.3 to 1.0 less than surrounding carpet	Likely Urine	Run one to three other tests to confirm urine.
Spots	Less than 4 or 2 points lower than surrounding carpet	If the spot is a color loss and there is a sulfur smell, then a reducing agent like sodium hydrosulfite is responsible.	Rinse and then neutralize the spot with hydrogen peroxide. Then repair the color.
Overall	7.0	Neutral Rinse	None
Overall	7.3 to 8.0	HWE with Stain Resist Detergent	None
Overall	8.1 to 8.7	HWE with pH 10.0 Detergent	Recommend acid rinse in cleaning
Overall	8.8 to 9.2	HWE with High pH Detergent	Recommend acid rinse in cleaning. Look for bleeding.
Spot	9.5 & higher	Oven Cleaner or bleach	Test for Chlorides to determine Sodium Hypochlorite

Numbers are bases upon five years of collecting field data. A 5.5 is the highest pH one should leave wool at. 5.5.

In closing, it should be kept in mind, that the pursuit of all science is a work in progress. Only the creator knows it all. The rest of us mortals are a work in progress. Therefore, additional work in this subject may be necessary.

⁶ <http://www.extech.com/instrument/products/alpha/PH100Water.html>