

Sensory Irritation During Use of Hair Color Products: “Can This Unpleasant Feeling be Reduced?”

Mandom Corporation (Head Office: Osaka, President Executive Officer: Motonobu Nishimura, hereafter “Mandom”) is involved in investigating and reducing the sensory irritation that may be experienced when using hair color products. As part of that research, we have researched the sensory irritation of the scalp during use of hair color products, independently established a method for appropriately evaluating this feeling, and found that this sensory irritation is caused by pH.

We plan to announce the results of this research at the Asian Society of Cosmetic Scientists (ASCS) Yokohama Conference on March 2-4.

1. Research Background

Currently, the most widely used hair color products are dual-component oxidative hair dyes. These produce long-lasting color, enable expression of a wide range of brightness and color tones, and are used by many individuals for many coloring purposes, such as fashion and gray hair coloring. The first component of this sort of oxidative hair dye contains the dye and an alkaline agent, while the second component contains hydrogen peroxide; users mix the two before use. The oxidative hair dyeing mechanism works as follows: hydrogen peroxide is decomposed under alkaline conditions to produce substances with strong oxidizing power, which further decompose the melanin in hair and simultaneously oxidatively polymerize the dyes in the formulation. In addition to the decomposition of hydrogen peroxide, the alkaline agent also swells the hair, making it easier for dye to permeate into its interior. These functions of hydrogen peroxide and the alkaline agent make it possible to simultaneously achieve two important functions for hair coloring: hair decolorization and hair dyeing.

However, despite this superior functionality, oxidative hair dyes may, during use, cause discomfort through a tingling sensation. Rarely, they can cause skin sensory irritation and inflammation. Although this sensory irritation has been attributed to alkaline agents, pH, and hydrogen peroxide, very few research reports on hair color-caused sensory irritation have been made.

Thus, Mandom has conducted research in order to determine the effects of the putative causative agents of hair color sensory irritation—pH and hydrogen peroxide—as well as the relationship between sensory irritation and hair lightening power (decolorizing power).

2. The Effects of pH and Decolorizing Power on Sensory Irritation

It has long been believed that the stronger the decolorizing power of a hair color product, the more likely it is to cause sensory irritation. Thus, we conducted an experiment on hair decolorization and skin sensory irritation using a sample containing ammonia and another sample containing ammonia and ammonium carbonate. As shown in Figure 1, the results of our decolorizing experiment indicated that the sample with ammonium carbonate had greater decolorizing

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power. Conversely, the results of our skin sensory irritation evaluation experiment indicated that the sample with ammonium carbonate caused less sensory irritation (refer to Figure 2). We believe that this is caused by the lower pH of the sample containing ammonium carbonate in comparison to the sample without the compound.

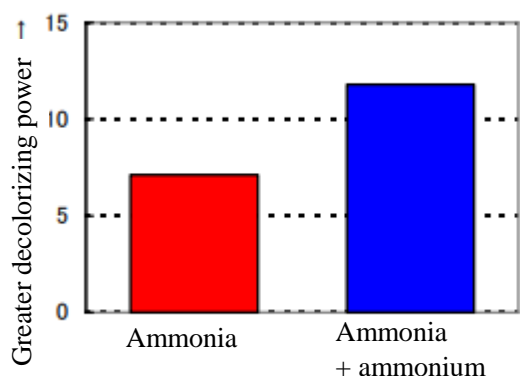
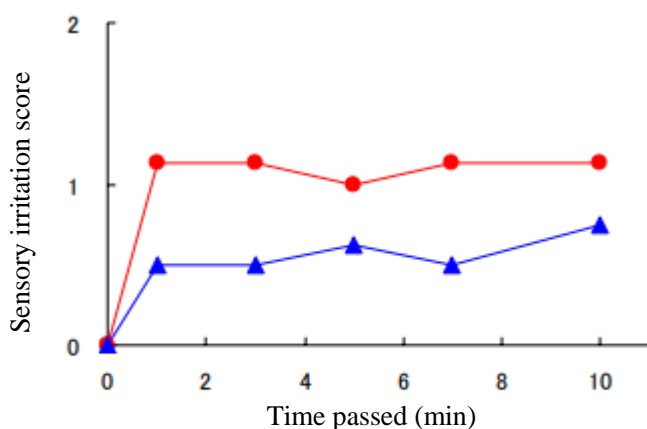


Figure 1: Differences in Decolorizing Power Caused by Alkaline Agents

ΔE: Indicates degree of color change. Higher values are correlated with greater decolorizing power.



Degree of Sensory Irritation	Score
Unbearable	3
Clearly perceivable	2
Faintly perceivable	1
No irritation	0

Figure 2: Intensity of Sensory Irritation Produced by Samples with Differing Decolorizing Powers

●: Ammonia
▲: Ammonia + ammonium carbonate

3. Effect of Hydrogen Peroxide on Sensory Irritation

Hydrogen peroxide, an ingredient in the second component of hair color products, is believed to greatly contribute to the sensory irritation caused by hair color. Thus, in order to clarify the effect of hydrogen peroxide on this sensory irritation, we conducted an experiment on skin sensory irritation using a sample containing 4% hydrogen peroxide and a sample containing no hydrogen peroxide. As a result, we discovered that the sample without any hydrogen peroxide

caused significant sensory irritation and the degree of this sensory irritation was identical to that of the sample containing hydrogen peroxide (Figure 3). Additionally, the sample that did not contain hydrogen peroxide caused subjects' skin to become red and experience a strong feeling of heat.

From these results, it is clear that sensory irritation during hair color treatment is not attributable to the strong oxidative power of hydrogen peroxide or attendant decolorizing power (or, only attributable to a negligible level). Sensory irritation depends largely on pH; high pH compounds cause sensory irritation accompanied by a burning sensation.

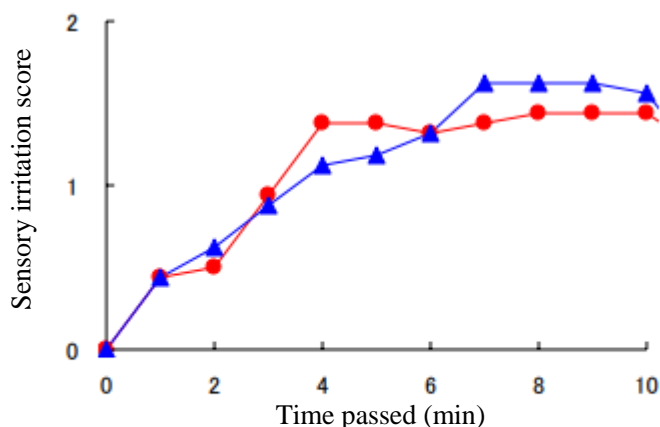


Figure 3: Differences in Intensity of Sensory Irritation based on the Presence or Absence of Hydrogen
 ●: 0% hydrogen peroxide
 ▲: 4% hydrogen peroxide

4. Future Applications in Hair Color Products

We plan to continue this line of research at Mandom, striving to reduce sensory irritation and other unpleasant feelings experienced during use of hair color treatment as much as possible and launch hair color products that can be safely and comfortably used by our consumers.

Finally, we would like to indicate that we expect our current research to lessen only sensory irritation associated with hair color use, not allergic reactions to hair color products. In order to prevent allergic reactions, the Japan Hair Color Industry Association advises that “individuals who have experienced rashes due to hair dyes” and “individuals who have felt sick after using hair dyes” avoid using hair color products. We publicize these guidelines on our hair color products and have not changed our belief that these individuals should avoid using hair color products.

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