

ANALYSIS OF FADING IN SODA CANS

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The Experiment:

Search and Rescue Field Teams often encounter potential clues that require an assessment by more specialized SAR resources, including “signcutters” or man trackers. When assessing such objects, and whether or not they are related to a missing subject, there are a number of factors to be considered. This brief paper studies the visual appearance related to the “color fading” of soda cans, a potential clue often observed in outdoor environments.

This experiment involved placing several types of empty soda cans in both direct and indirect (afternoon or morning sun only) sunlight over a period of 7 months. The brands were Mr. Pibb, Mountain Dew, Pepsi, and Coca-Cola. The actual experiment was carried out by 9 year old Shane Winston, of Winchester, Virginia.

Summary of Findings:

It is clear that SAR Field Personnel cannot “age” a soda can based upon color alone. Yet the experiment does demonstrate a clear distinction in “lightfastness” among the soda cans, as well as a fairly consistent timeline of fading of specific colors. The experiment results show highly saturated colors (green, black, and dark blue) found on the soda cans retained their appearance much longer than those with less saturation (red and red-brown).

The dark green coloring found on Mountain Dew cans demonstrated a very low degree of fading over the course of the experiment. A discarded Mountain Dew can may therefore appear new even after several month of partial light exposure.

Black lettering found on all cans retained their color over the course of the experiment.

The red-brown found in Mr. Pibb faded most quickly and completely over time. They consistently showed significant fading at 30 days, and by the end of the experiment lost all hint of red-brown on the exposed surfaces

The brighter reds found on Coca-Cola cans and in the lettering on Mr. Pibb cans faded at significantly slower rates, usually evidenced between 30-60 days.

Discussion:

The visual appearance of soda cans is one of the most important commercial attributes. Appearance is meant to attract the attention of the customer. The quality of the can’s appearance is psychologically important, and will often determine how well the object is received.

One attribute of color as seen by an observer is “saturation”. That is, how far the color is from the gray (lightness) axis, or how close it is to the perceived pure color. A lighter pastel, for example, has lower color saturation than a pure color. The red in Coca-Cola cans have higher color saturation than the reddish-brown found in Mr. Pibb cans.

Since visual appearance is critically important, soda cans are designed to retain their appearance under normal indoor conditions. They are not designed to withstand the presence of weathering

phenomena, such as wind, rain, and prolonged sunlight. Soda cans are not designed to retain their appearance in outdoor environments.

Dyes and pigments found in soda cans contain chemical bonds which can be broken down by the ultraviolet rays contained in sunlight. This alters the shape of the molecules which, in turn, destroy parts of the molecules that make the soda can appear as a certain color. That is, they cause the overall color to “fade”. A soda can’s durability and resistance to fading in sunlight (or “lightfastness”) over time can be critical in assessing the age of the object. A color is termed lightfast or light stable when it does not fade upon exposure to light.

Color is not a physical property of materials. Rather, color is a human perception based upon three key components: the light source, the object (which modifies the light), and the observer who perceives color and appearance. The same individual can perceive colors differently based upon illumination, viewing angle, and even mood.

The visual assessment of degree of fading over time is therefore very subjective. It can be improved by comparing the faded object with a “reference” object, or store-shelf quality object is available. This is often not possible in the field, but was possible within the context of the experiment.

Among the more specific findings of this experiment were:

1. The brown-red color found in Mr. Pibb cans began showing evidence of fading at the 30 day mark for both partial and full sun-exposed cans. The fading at 60 days was significant, and by the end of the experiments these cans lost all hint of the original red-brown coloring. The yellow lettering found on these cans did not significantly fade. The only color not showing any evidence of fading was the black lettering.
2. The red color found in fully exposed Coca-Cola cans began showing evidence of fading between 30-60 days. By the end of the experiment, fully-exposed surfaces lost all hint of the original red color. The black lettering did not show evidence of fading. The partially-exposed cans began showing significant fading after 60 days.
3. The blue color in Pepsi cans began to show some evidence of fading at the two month mark. The Pepsi cans were only placed in the experiment briefly, and were not studied past the two month mark.
4. The green color found in Mountain Dew cans generally did not show signs of fading until after the second month. It was noted that 2 month old cans appeared like newly-placed cans. Over time, not much fading of the green occurred, and it was noted that they appeared to lose more luminosity than color. That is, the green appeared simply “less bright”. One exception was found in the word “Mountain”, which changed from green to light blue by the month’s 6 and 7. The red lettering contained on these cans showed evidence of fading between 30-60 days.