Simplified Apparatus and Techniques for Evaluating the Stability of Color Imaging Materials to Environmental Pollutants

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Abstract

For those working on image permanence standards and companies trying to determine useful shelf life of some of the newer ink jet and thermal media products, it has become very apparent that traditional dark and light accelerated methods are not always accurate predictors of real shelf life. It is now known that accelerated tests may actually predict better shelf life then is observed in real life storage conditions. One of the major factors that is now suspect in reducing real shelf life is the interaction of environmental contaminants with the products subjected to light and dark storage conditions, or display conditions. Among the strongly suspect contaminants one stands out; ozone and its by-products.

Setting up chambers to study ozone levels that are equal to or at higher concentration then found in the natural environment, can be very time consuming and expensive. Furthermore it requires extensive monitoring by skilled operators, and may require many varied conditions.

In this paper the author will describe some simple techniques that have been evaluated to give useful methods for testing products and that lead to results not unlike those obtained using ozone spiked atmospheres.

One such system uses a chamber containing an atmosphere of peroxy-acetic acid, air and water. The active radicals produced by such an atmosphere are not unlike those created in an ozone, air and water environment. These radicals can attack dyes and pigment colorants, cause bleaching or discoloration, including yellowing of white image areas.

By varying the concentration, temperature and light activation of these atmospheres, mild to severe conditions can be established inside chambers leading to accelerated image degradation. To correlate the severity of the accelerated condition to actual shelf life, it is necessary to set up paired experiments and follow actual shelf life of various products.

Chambers can be maintained at various relative humidities, have circulating fans to maintain uniform atmospheres and can be exposed to illuminated conditions to light activate reactions. Materials of construction are pre-ferably high density polyethylene or poly propylene, which are relatively inert to the atmospheres created. Although the precision of these simple methods are less then carefully constructed commercial chambers, nevertheless they provide useful information quickly and at low cost.

Chemical equations will be presented that shows the radicals produced by two systems, ozone versus peroxy-acetic acid and examples will be shown how some typical products respond to these conditions. These tests will also compare south window testing to accelerated chambers of similar color images.

Colorimetric test strips are available that provide rapid information on ozone within low concentration ranges. These are calibrated by more expensive and sophisticated methods but give qualitative results rapidly.

Until an extensive database has been developed on various products it will not be possible to determine which accelerated method is best suited for long term storage prediction of a product. Additionally, if test methods are too complicated or expensive they will not be done and the public as well as producers will be deprived of predictive results.

The author wishes to share the simplified methods he has developed and demonstrate how easy and inexpensive they are to set up. It this way it is hoped that others will use them to expand an empirical data base on new and existing color products.

Biography

Peter Roth received his degrees in Chemical Engineering from C.C.N.Y, graduate degrees in Physical Chemistry and Solid State Physics from Northeastern Univ. He spent 40 years at Polaroid Corp. in various capacities, retiring as a Research Fellow. Extensive experience in design of instant and conventional imaging products as well as newer electronic media. Responsible for bringing numerous products from conception to full production. Overseeing highly skilled technical people and directing their efforts. Extensive experience in coating methods and preparation of complex coating fluids to manufacture sophisticated imaging products.

He is currently president an Applied Technology Consulting Co. and director in a small electronic manufacturing operation making precision printed circuit boards by proprietary patented methods.