C·T·I
CHROMATIC TECHNOLOGIES, INCORPORATED

DynaColor™ DATA SHEET

THERMOCHROMIC UV FLEXOGRAPHIC INK

DESCRIPTION

DynaColor™ thermochromic flexographic inks, in printed form, are colored below a specific temperature, and change to colorless or to another, lighter color as they are heated through a defined temperature range. These inks are available in various colors and activation temperatures. Standard activation temperatures are 15, 31 and 45° C (59, 88 and 113° F). Other activation temperatures are also available, from -5° C to 65° C. The activation temperature is defined as the temperature above which the ink has completely changed to its final clear or light color end point. The color starts to fade at approximately 4° C below the activation temperature and will be in between colors within the activation temperature range. The color change is "reversible," i.e., the original color will be restored upon cooling. See Color Availability Chart for a complete list of available colors. **DynaColor™** flexographic ink is ideal for document security, promotional items, temperature indicating labels, packaging, games, novelties, etc.

TYPICAL PROPERTIES

Viscosity (at 25° C, #3 Zahn Cup)	60-90 sec
Density (Approx.)	8.5 lb./gal
Appearance	Viscous Liquid
Percent Solids (Approx.)	90%
Percent Volatiles (Approx.)	<2.5%
Food Contact Compliance Status	Approved for Indirect Food Contact
Yield Range (Approx.)	10,000-75,000 in^2/lb. (depending on film thickness)
Recommended Substrates	Paper, Film

STORAGE AND HANDLING

The inks have excellent stability when stored away from heat. The material is combustible and should not be used near open flame. Store Below 90° F. Must be used within six months of purchase. Storage longer than six months not recommended. Consult product MSDS prior to use.

SPECIAL CARE INSTRUCTIONS

DynaColor™ flexo ink is simple to use, but it is a little different from other UV flexo inks. The differences between our ink and regular UV flexo inks are outlined below. The instructions below should be followed carefully to achieve optimal results. One of the main objectives in this process is to maximize the coating weight. Thermochromic ink is a light-colored ink. The way to achieve the darkest color is to get the highest coating weight possible. If you have your own techniques for increasing coating weight, feel free to try them as well.

- Use the smallest anilox number possible. It should be lower than 350. An anilox of below 150 is recommended where high color is desired.
- Print only on uncoated paper or semigloss paper. This formulation is made specifically for paper, and should not be printed on plastic or coated stock without first consulting with CTI. Compatibility of ink, coating and stock must be determined prior to production runs.
- Use a hard sticky-back.
- Use rubber plates with soft durometer.
- Use very little nip pressure.
- Use a doctor blade instead of a metering roller. If the doctor blade is metallic, be sure the anilox used with the doctor blade is ceramic.

- The viscosity of the formulations varies slightly between colors and will be on the high side. This higher viscosity is by design. The results achieved using this thicker ink will be superior to lower viscosity thermochromic inks. Lower the viscosity by adding a low viscosity monomer.
- The volume of the cells should be as high as possible.
- Be sure to stir the ink well before and during use. Upon extended storage, the ink may separate. This can be remedied by stirring well before use.
- Clean up with regular solvent, but DO NOT allow the unused ink to come in contact with the solvent. Be sure the press is dry before adding any ink to it. Remember that whatever comes in contact with the ink can have an effect on it. Solvents are therefore to be avoided.

SENSITIVITY

Thermochromic materials are sensitive to adverse environmental conditions. These are listed below, along with a description of the nature of the sensitivity, and recommendations with regards to them.

LIGHT: Most significantly, long exposure to UV and some fluorescent lights can degrade color intensity and changing characteristics of the ink. Extreme exposure of more than several days of direct sunlight may degrade the color of the ink, though it will probably still change colors. More than 600 hours of a strong fluorescent light may also cause a loss of color in the thermochromic. This is true of many different pigments and dyes. In handling these materials, a good rule of thumb is to assume that they art about as sensitive to light as fluorescent pigments are.

HEAT: Extended exposure to very high temperatures, i.e., 100° F or higher, can also degrade the pigment. The effect of light exposure seems to be additive over time. However, with heat, the exposure only has an effect if a given temperature is constantly maintained for a given amount of time. For instance, if a printed piece is left in a car on a hot day, out of the sun, at a temperature of around 130° F for eight hours, one might see slight degradation of the piece. If the same piece is left in the car on a cooler day, say 100° F for the same amount of time, no degradation would be seen. This could happen for months on end before any degradation was seen, as long as the piece were returned to a cooler temperature for the other sixteen hours of the day. If the piece were left in an environment where it remained at 100° F for many days, one might then expect to see a reduction in color. In other words, the effect is time- and temperature-dependent.

CHEMICALS: Thermochromic materials are sensitive to chemical exposure as well. Since it is very unlikely that the printed piece will come into contact with deleterious chemicals under normal conditions, this should not be of great concern. On the other hand, because of the chemical sensitivity and softness of this ink, it also has excellent anti-alteration properties.

CONCLUSION: In short, this ink should be stored in a cool, dry place, away from direct exposure to light, especially sunlight. This is true of both the printed ink and the wet ink. Ink in the can should be used within six months of receiving it. If the color or color reaction is compromised in a security environment, one need only to continue to verify the authenticity of the document by other means; ghost watermark, bleed through inks, etc. We predict that with proper handling, the failure rate of the ink will be less than one half of one percent, and as mentioned above, this means that one need only continue to verify authenticity and not redeem the document for cash until confirmation is established.

NOTE REGARDING HYSTERESIS: Reversible thermochromics exhibit what is referred to as “hysteresis.” In other words, if a standard “Body Temperature” ink is raised to an extreme temperature, say above 150° F (as with a curing unit), then left to cool under normal ambient conditions (65° to 75° F), the ink may not achieve its full color, even after it reaches room temperature. Although, under normal circumstances the ink should have full color up to 7-8 degrees below the stated activation temperature, once exposed to this kind of temperature “spike,” one may need to lower the ink’s temperature to below 50° F to gain improved behavior. ALL APPLICATIONS USING COLOR-CHANGING INKS OF ANY KIND SHOULD BE THOROUGHLY TESTED PRIOR TO APPROVAL FOR PRODUCTION.

For further information or assistance, please contact Chromatic Technologies, Inc. at (888) 294-4CTI.