FLEXOGRAPHIC INKS FOR SHRINK SLEEVE.
HIGHLIGHT PRODUCT: QUALICURE™ GU9600Z, QUALICURE™ GU9700Y.

Richard Chao
Qualipoly Chemical Corporation

INTRODUCTION

The shrink sleeve market is growing annually at very rapid rate up to 15%. The shrink film producers are constantly making changes in their products to make them more environmentally friendly and more efficient.

The purpose of this promotion report was to develop new products that would print on different shrink sleeve films and exhibit excellent printability and end use properties such as adhesion, block resistance, low shrinkage with consistent optical properties.

QualiCure flexographic inks, especially in Shrink Sleeve application.

These products have been performance evaluated in four YMCK colorants and compared to an industry standard for flexographic inks.
TEST PROCEDURES AND EQUIPMENTS

Ink Formulation

Inks were formulated on a laboratory scale using Y(128) M(57:1) C(15:3) K(CB) pigments blended with GU9600Z and GU9700Y individually(Oligomer 80%, Pigment 15%, GI184 5%).

The ink formulations were dispersed using a the three milling roller for 15 minutes.

Film Substrates

Polyvinylchloride (PVC), oriented polystyrene (OPS), and glycolmodified polyethylene terephthalate (PETG) substrates were obtained from various plastic suppliers.

Flexo Printing

Flexo Hand proofer was used to print formulated inks. Coating weights were 0.7 lbs/ream to 1.0 lbs/ream depending on the color.

End-use Properties of Printed Films

Following end-use properties were tested before and after the ink was printed and sleeve was shrunked:

• Tape adhesion (610 Scotch tape);
• Pigment Wetting: Shortness Index;
• Block resistance (42 °C @ 10 PSI for 24hrs);
• Abrasion resistance (nail scratch);
• Ice-water crinkles resistance;
• 4 °C water for 10 min;
• Shrink ability (No haziness and cracking after 120 °C for 3 mins);
• Curing Energy curing energy is 500 mJ/cm2, confirmed by MEK double rubs.
<table>
<thead>
<tr>
<th></th>
<th>QualiCure™ GU9600Z</th>
<th>QualiCure™ GU9700Y</th>
<th>Industry Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity (cps) four color</strong></td>
<td>900~1,200</td>
<td>800~1,100</td>
<td>14,590</td>
</tr>
<tr>
<td><strong>Shortness Index Y</strong></td>
<td>2.1</td>
<td>2.5</td>
<td>2.68</td>
</tr>
<tr>
<td><strong>Shortness Index M</strong></td>
<td>2.15</td>
<td>2.2</td>
<td>2.94</td>
</tr>
<tr>
<td><strong>Shortness Index C</strong></td>
<td>1.8</td>
<td>1.7</td>
<td>2.55</td>
</tr>
<tr>
<td><strong>Shortness Index K</strong></td>
<td>2.35</td>
<td>2.0</td>
<td>2.35</td>
</tr>
<tr>
<td><strong>Curing Speed (500mJ/cm²) four color</strong></td>
<td>Pass (no shrinkage)</td>
<td>Pass (no shrinkage)</td>
<td>Pass, but high shrinkage</td>
</tr>
<tr>
<td><strong>Adhesion test (After UV curing) four color</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Fail</td>
</tr>
<tr>
<td><strong>Adhesion test (Cured films, After 120°C for 3 mins) four color</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Fail</td>
</tr>
<tr>
<td><strong>Block resistance four color</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td><strong>Abrasion resistance four color</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Fail</td>
</tr>
<tr>
<td><strong>Ice-Water wrinkle resistance (four color)</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Fail</td>
</tr>
<tr>
<td><strong>Shrink ability (four color)</strong></td>
<td>Pass</td>
<td>Pass</td>
<td>Fail</td>
</tr>
</tbody>
</table>
Pig1: The YMCK inks base on QualiCure™GU9600Z and QualiCure™ GU9700Y on PET films.

Pig2. The left film is ink based on industry standard oligomer which demonstrate higher shrinkage than GU9600Z and 9700Y

Pig3. The left film is ink based on industry standard oligomer showing ink peel after twisting. GU9600Z and GU9700Y (right film) does not show ink.
OBSERVATIONS

The ink based on QualiCureTM GU9600Z and GU9700Y developed improved linear flow properties, had lower shrinkage and good pigment wetting ability in four YMCK colors than the industry standard oligomer.

Significantly, the QualiCureTM GU9600Z and GU9700Y based ink has higher adhesion ability (after cure or after 3 mins at 120 °C) than the industry standard based ink.

The QualiCureTM GU9600Z and GU9700Y based inks in four color have good block resistance, ice-water resistance and low shrink.

CONCLUSION

The ink based on QualiCureTM GU9600Z and GU9700Y the following properties:

- Low viscosity
- Low odor and VOC free
- High color density
- Excellent abrasion resistance
- Good gloss finish
- Fast cure, but low shrinkage
- Suitable for multiple substrates
- Food package suitable