

# COLORSHARP Technology of the New KODAK GOLD 400 Color Print Film

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## Abstract

The new Kodak Gold 400 print film was introduced this spring. This film is extremely flexible having been designed for use in all lighting conditions and delivering extremely sharp prints with brilliant colors. The colors produced with Kodak Gold 400 color print film are not only saturated, they are also accurate: a true color film from Eastman Kodak Company. In addition to its long latitude, excellent keeping stability, and accurate, saturated colors, the robust performance of Kodak Gold 400 color print film under the wide range of processing conditions found in the trade ensures our customers get the sharp, colorful pictures they want more of.

The most advanced imaging chemistries, silver halide emulsion crystals, and film design technologies have been integrated to achieve the high overall performance of Kodak Gold 400 color print film. Our highly efficient T-Grain® emulsion technology has achieved new levels of performance by incorporation of SETA technology (Shallow Electron Trapping Agents). Prints having unsurpassed color accuracy result from the application of our new sensitizing dye technology producing films which "see" the world more like our own eyes. Information recorded by the individual film layers is adjusted through precise control of their interactions, made possible by proprietary UDIR (Universal Development Inhibitor Releasing ) Coupler technology, to bring out the brilliant, true colors of the photographed scene. Electronic charge stabilization agents incorporated in the film and new precise chemical sensitizing agents are used to prepare the light sensitive silver halide crystals, which combine to give Kodak Gold 400 color print film excellent stability over time to deliver consistently high performance.

Our presentation will provide a more complete description of the technologies listed above and how they combine in Kodak Gold 400 color print film to deliver exceptional quality and performance.

## Introduction

Even though there were many new technologies introduced in the new Kodak Gold 400 color print film, the following five technologies were key to its success:

1. Human-eye sensitivity (HES) to enable the film to "see" colors more like our eyes.
2. UDIR coupler to boost color saturation and color accuracy.
3. Shallow electron trapping agent (SETA) to improve emulsion efficiency.
4. Electronic charge stabilization agent (ECSA) to improve film keeping.
5. Precise chemical sensitizing agents (PCSA) to improve emulsion stability.

In order to bring about the superior color and sharpness of this film while maintaining constant performance, all five technologies are important to our success.

## Human-Eye Sensitivity (HES) Technology

The human eye sees colors differently than traditional color films. Traditional photographic film sensitivities capture the near infrared reflectance of objects that the eye is not sensitive to. As a result, consumer films (available presently) produce colors that sometimes differ from how you saw them.<sup>1,2</sup> Our new short-red sensitization coupled with refined blue and green light sensitization allow the new Kodak Gold Film to capture pictures more nearly as your eyes see them.

The new short-red sensitizing dye technology not only allows us to achieve HES, it also makes our new films bleach better during processing --- a true breakthrough for our customers.

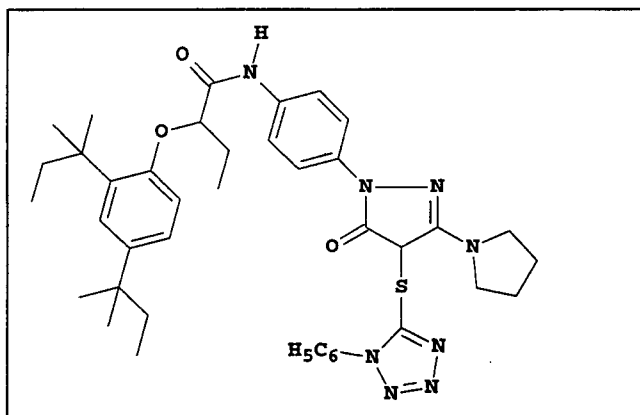
## Universal DIR (UDIR) Coupler Technology

In order to achieve Human-eye sensitivity (HES), Gold 400 Film utilizes UDIR coupler technology in conjunction with DIR couplers to fine tune the interlayer interimage effects (IIE). These effects bring about accurate and saturated colors. By incorporating UDIR technology in the green record of our film,<sup>3,4</sup> the onto-green IIE term were significantly enhanced (see table below) as required to precise balance interimage for color.

### Interlayer Interimage Effect (IIE) of UDIR Coupler In Multilayer Film Green Record

DIR Coupler	Gamma G of G	Gamma G of N	Gamma Ratio
DIR-A	1.33	0.71	1.87
UDIR-1	1.76	0.73	2.41
UDIR-2	1.90	0.75	2.53
UDIR-3	1.46	0.74	1.97
UDIR-4	2.00	0.79	2.53

### MAGENTA DIR-A



### Shallow Electron Trapping Agent (SETA) Technology

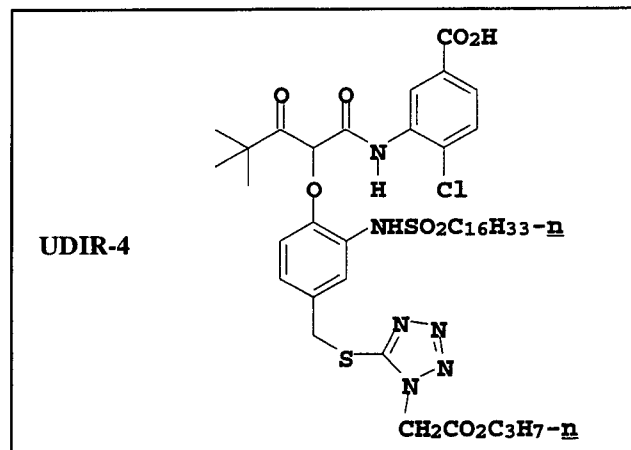
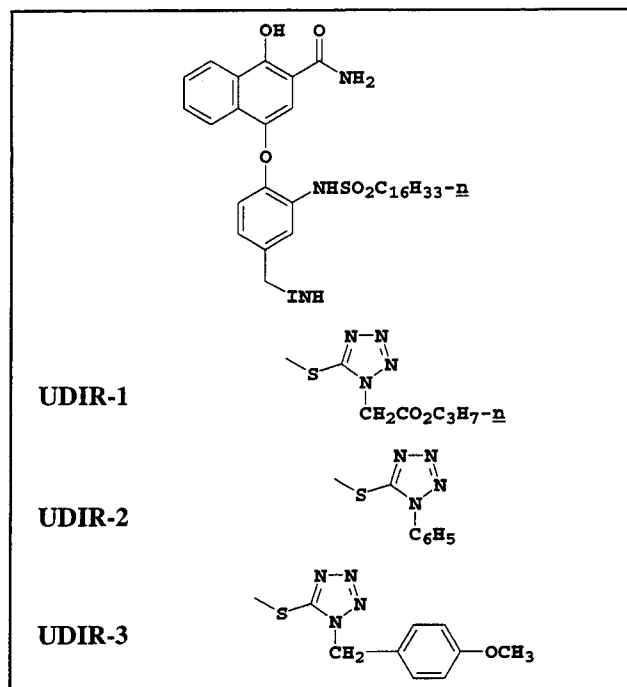
In order for the new Kodak Gold 400 film to deliver pictures with rich, brilliant, and accurate colors, without compromise other attributes of image structure, a significant improvement in emulsion technology had to be accomplished. By incorporating SETA in our T-Grain® emulsions, we have improved their light detecting ability without making the silver halide crystals bigger.<sup>5</sup>

The new dopant technology applied in the T-Grain® emulsions allows the photogenerated electrons to be held momentarily at the shallow electron trapping sites. The high concentration of photogenerated electrons at these sites enhance the latent image formation and compete effectively with recombination. As the result of SETA, an emulsion speed/grain advantage was realized.

### Electron Charge Stabilization Agent (ECSA)

Consumer color negative films often experience a wide range of keeping conditions before they are returned for photofinishing. Large sensitometric changes (due to keeping) would negatively impact the final print quality. Keeping changes can occur during shelf storage prior to exposure (raw stock keeping), or following exposure in the camera

### UDIR COUPLERS



(latent image keeping). A film with good keeping makes good economic sense. Not only final customers are satisfied, but the shelf life of the product is also extended. The majority of the observed keeping changes result from emulsion sensitivity changes. We found that the addition of an electron charge stabilization agent (ECSA)<sup>6</sup> to our film improved the coated emulsion stability for both raw stock keeping and latent image keeping.

### Precise Chemical Sensitizing Agents (PCSA)

We found that emulsions sensitized with PCSA keep better than the conventional sulfur/gold sensitization. By using emulsions sensitized with new sensitizing agents<sup>7</sup> we found that we could improve the rawstock keeping of our new Gold films.

## References

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4. *Begley and H. Ling, U. S. Patent No. 5,272,043 (12/21/1993).*
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