Computer to Plate Technologies- The Current Product Realities

H. Peter Herting *and Richard M. Goodman*

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Abstract: There has been a great deal of hype and misinformation about the nature of computer to plate technologies. In particular, there is a need for a fair comparison of various plate technologies based upon the laser image technology, plate construction and press running characteristics. It is the purpose of this paper to review computer to plate technologies with emphasis on the digital plates, the compatibility with particular lasers and digital plate setter technology technology. Practical suggestions and hands-on information are presented to show how to optimize performance.

Introduction

Computer to plate technologies (CTP) have become fully commercial. That is, there are now enough users of enough different technologies to require that the uninitiated need guidance to discern the characteristics of each of the technologies. It is the purpose of this paper to present the current reality in CTP.

The bulk of this paper will consist of descriptions of the currently extant CTP plate concepts. The CTP technologies will be broken down by the nature of the laser used to image the plate. The plates suitable for use with visible laser technologies will be discussed first; thermal laser plates will follow.

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*Kodak Polychrome Graphics

Visible Laser Imaged Plates

The table 1 summarizes the plate offerings from the various plate manufacturers which are visible laser imageable. The plates fall into three major categories: Polymer (that is, photopolymer), silver halide internal diffusion transfer and hybrid. The plates can be further differentiated by the substrate, either aluminum or polyester. Note that these plate concepts by and large are offshoots of film concepts. That is, suppliers developed imagesetter films and then developed plate offshoots. The photopolymer systems proceeded from earlier projection plate concepts.

Table 1. Digital Plate Technology (Sensitivity range 450-700 nm)

Manufacturer	Technology	Substrate	Name	Laser
Agfa	Polymer	Al	N90A	Ar-ion, HeNe FD-YAG
Fuji	Polymer	Al	LPA LPY	Ar-ion FD-YAG
Mitsubishi	Polymer	Al	Diamond	Ar-ion, FDYAG
Agfa	IDT	Al	Lithostar+ LAP-O LAP-B LAP-R	 HeNe,FD-YAG Ar-ion, camera Red laser diode
		PET	Setprint	450-700nm
(Dupont)	IDT	Al	Silverlith SDB	Ar-ion, HeNe FDYAG,camera
Mitsubishi	IDT	Al	Silver digiplate	Ar-ion, RLD FD-YAG
		PET	Silver digiplate	Ar-ion, RLD FD-YAG
Kodak Polychrome Graphics	Hybrid	Al	CTX/YSN/YSP	Ar-ion, HeNe FD- YAG,camera
			CTX/RSN/RSP	Red laser diode

The wave length characteristics of the lasers involved are described in table 2 below. The plate types in table 1 fall into the three categories of polymer (meaning high speed photopolymer), IDT= silver halide internal diffusion transfer, and hybrid. The hybrid refers to use of a silver halide topcoat used as a mask over a conventional UV sensitive under coat. Detailed descriptors of typical plate constructions for the three systems are shown later in the paper.

Photo polymer plate constructions (see figure 1) require post-exposure processing similar to conventional UV sensitive plates, though they may utilize a small preheat section to provide minimum laser exposure requirements. These products have seen their major commercial success in newspaper and applications where rapid turnaround in pre-press is most significant.

Internal diffusion transfer plates(see figure 2) require a development step through what looks much like a film processor. Early on some of these plates worked best with special fountain solutions, current versions work equally well with conventional fountains. Their major success is in commercial applications for medium run web applications.

The hybrid plate technology (see figure 3) employs a silver halide emulsion on a (usually) positive plate coating. The plate setter exposes the silver emulsion which is in situ developed in the processor to form a photomask for the conventional plate coating which is in situ flash UV exposed. The mask is removed and plate developed. The plate has exposed as a film; on press it is a conventional plate. The technology has made inroads in all applications, especially longest run uses. The complex processing has led to some resistance of this technology. For all of the digitally imaged plates the key advantage is the superior resolution: since the laser beam does not spread or readily scatter, the spot is sharper than in conventional UV flood exposures.

Table 2 summarizes the laser devices which are used to expose visible laser plates. The wavelengths for each laser are described.

Table 2. Lasers in Graphic Arts

Type	Example	Abbrev	Wavelength
Gas Laser	Argonion	Ar-ion	488nm
	Helium Neon	HeNe	630nm

Solid state	Neodymium	Nd-YAG	1064nm
	freq doubled NdYAg	FD-YAG	532nm
Laser diodes	Red laser Diode	RLD	670nm
	High power diode	HP LD	830nm

Plate Setting Devices

The plate setters which employ the various lasers fall into three major categories: external drum, internal drum and flat bed. All image setters utilize sophisticated raster imaging menus which proscribe the on/off cycle of the lasers as they scan the plates. The number of available models of imagesetters far exceeds the number of available plate types and are not listed here.

The external drum machines employ a plate handling technique which captures the plate by adhesion to a drum with a vacuum, magnetic or clamp lock up with the plate coating facing outward on the drum. The plate is exposed by a bank of lasers moving parallel to the drum axis as it spins . In effect, the image is inscribed onto the plate almost as a lathe would inscribe a cylindrical piece.

Internal drum machines employ vacuum, magnetic or clamp lockups which secure the plate to the inside of a cylindrical drum with the coating side facing inward to the axis of the drum. The drum generally features a mirror mounted on a "frictionless" bearing to deflect a strong single laser beam, aimed straight down the axis, towards the drum interior spinning at extraordinary speeds. The mirror both translates and spins to again create a image with also a profile like a lathe inscription.

Flatbed machines employ the plate in a flat usually horizontal surface. The bank of lasers scan the plate much as a TV raster creates a screen image.

For all imagesetters a key to performance lies in the "knitting" of the scanned images to eliminate both gaps and overlaps between consecutive scan lines whether circumferential or TV rastered. Obviously the mechanical precision of the equipment is crucial to resolution. One would be wise to survey field experiences among the manifold imagesetters to determine the best machine for your particular application and your particular tradeoff between cost , robustness and performance.

One other factor which is of some relevance is the maintenance of imagesetter equipment. Again the experiences of users is critical to determining the best value among machines. However, in one aspect, the laser performance, there is some generic experiences. Table 3 summarizes the approximate typical lifetime for a particular laser and the expected replacement costs.

Table 3. Laser Replacement Costs

Laser Type	Example	Typical Lifetime	Cost/unit
Gas Laser	Ar-ion	6-9 months	US $ 6-10000
Solid State	FD-YAG	9-15 months	US $12-18000
Laser Diode	RLD	2-4 years	US $ 200
Laser Diode	HP LD	2-3 years	US $ 1500

From these replacement cost numbers it is clear why the use of laser diodes (LDs) will increase at the expense of the other devices.

The plate technologies which are sensitive to lasers in the 700-1100nmrange are generally called thermal digital plates. That is, the primary energy process is heating of the coating in the area of the laser strike. The thermal mechanisms for forming the images fall into several types: cross-linking preheat negative types, exposure of non-image area positive, thermal mask type, ablative no process, and two types of waterless thermals; ablative and non-ablative. The major advantages of the thermal plate concepts are:

Daylight handling: Generally most thermal plates are stable in ordinary room light for at least 20-30 minutes versus a few moments for conventional plates.

User friendly: Easily handled in daylight, exposed under precise controlled conditions, processed directly.

Provide good press performance, long runs and good resolution.

Table 4 summarizes the plate offerings in thermal digital plates.

Table 4. Thermal Digital Plates laser Sensitivity Range 700-1100nm

Manuf.	Imaging Tech	Substrate	Name	Laser
Agfa	non-image pos	Al	Thermostar	HP LD 830, YAG 1064
(Dupont)	ablation/no process direct	Al	Silverlith SDT	YAG 1064
Kodak Polychrome Graphics	Cross-linking neg, preheat	Al	DI TPP 830 (Quantum 830)	HP LD 830
(Anitec)	non-image pos	Al	Electra	HPLD 830, YAG 1064
Kodak Polychrome Graphics			DI TPP IRx	HPLD 830,900, YAG 1064
	Thermal mask pos or neg	Al	Quantum NPH	HPLD 830 YAG 1064
	Non-ablative waterless	Al	Quantum NAW	HPLD 830, YAG 1064
Presstek	Ablative waterless	Al, PET	Pearl Dry	HPLD 900
	Ablative, conventional	Al	Pearl Wet	HPLD 900
	Ablative, conv, no process	Al	Pearl Gold	HPLD 830,900 YAG 1064

When the thermal crosslinking preheat plates are laser exposed the thermal spot creates an image but at this point it is not completely hardened. In some cases the plate is but 10 % exposed! However, the heat has formed an acid which when further heated by the preheat oven crosslinks the polymers in the coating forming the final hard image. The plate is then developed to remove the non-crosslinked species, much as a conventional plate. (As a side note, the preheat thermal plates can be exposed in a conventional frame, at a long exposure time, and preheated and developed to give a suitable press ready plate.)

The thermal plates referred to as the "non-image positives" utilize the concept that the thermal beam causes the decrosslinking or solubilization of the coating. That is, these are positive working systems. They require processing in what looks like a conventional positive type plate processor. Because they do not require preheating ovens they are less obtrusive in the press room, but need longer exposures. Press performance is good, but yet to be proven comparable to the preheat thermal plates baked.

The ablative plate technologies are generally positive working (for conventional printing). That is the thermal beam decomposes and ablates coating; the remaining areas are the image areas. Some form of wiping is usually required to remove the ablated debris. Devices built into the image setters to vacuum away the debris are promised which will significantly improve performance of these type plates.

Ablative waterless and the non-ablative waterless are both negative working systems. In the former the thermal laser ablates away the underlying coating and the overlying silicone (ink repellent layer). In the non-ablative waterless, the thermal laser decrossslinks the coating enabling development of the underlying coating and the overlying silicone. The thermally struck areas in both cases are the ink accepting areas. The figures 4-9 describe in better detail the structures of the thermal plate technologies.

Overview

Computer to plate technologies have enabled the printer to dramatically change the work flow in the pre-press area. Ultimately the efficiencies of this work flow change will lead to very rapid turnaround and economies of staff. On press the CTP products in most cases are compatible with conventionally imaged plate products, whether waterless or using conventional ink and fountains. Thus the computer revolution does not significantly change the pressroom operations, except to the extent that many plate setter devices lend themselves to placement in the pressroom rather than a prepress areas.

This paper does not discuss the "on-press" exposure concepts, such as the Quickmaster DI or Karat 74 machines. Further, we have not discussed the direct to paper technologies such as the Indigo or Xeikon devices. It has been the purpose of this paper to highlight the available computer to plate concepts, give the details of their design and some measure of their performance characteristics.

Figure 1 Photopolymer Technology

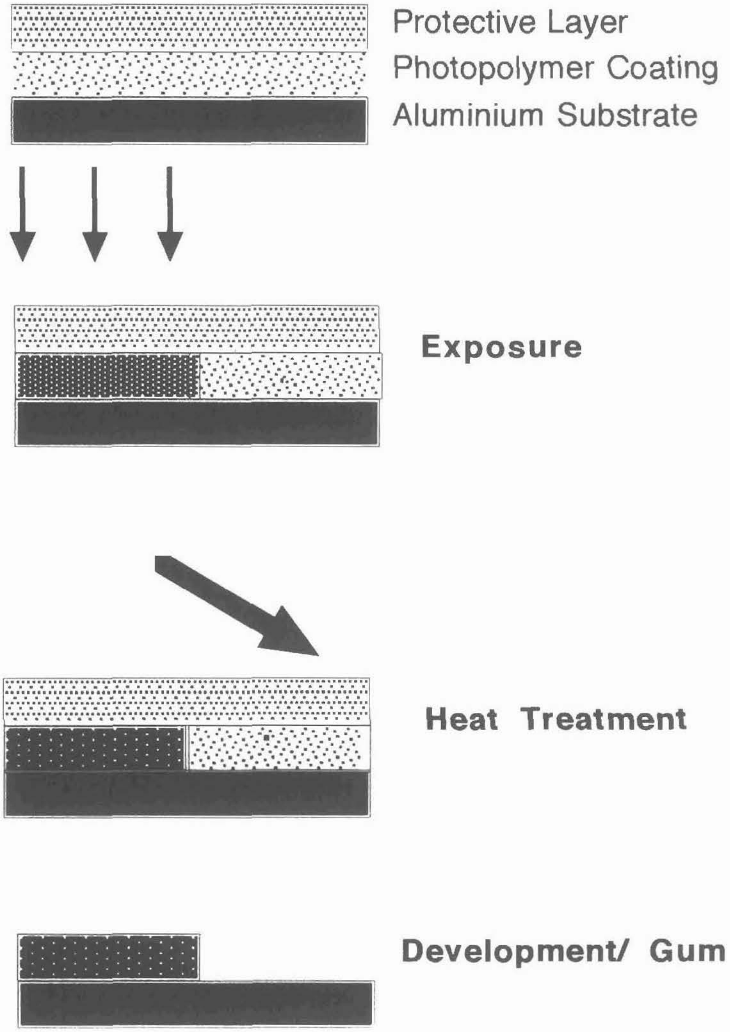


Figure 2. Internal Diffusion Transfer

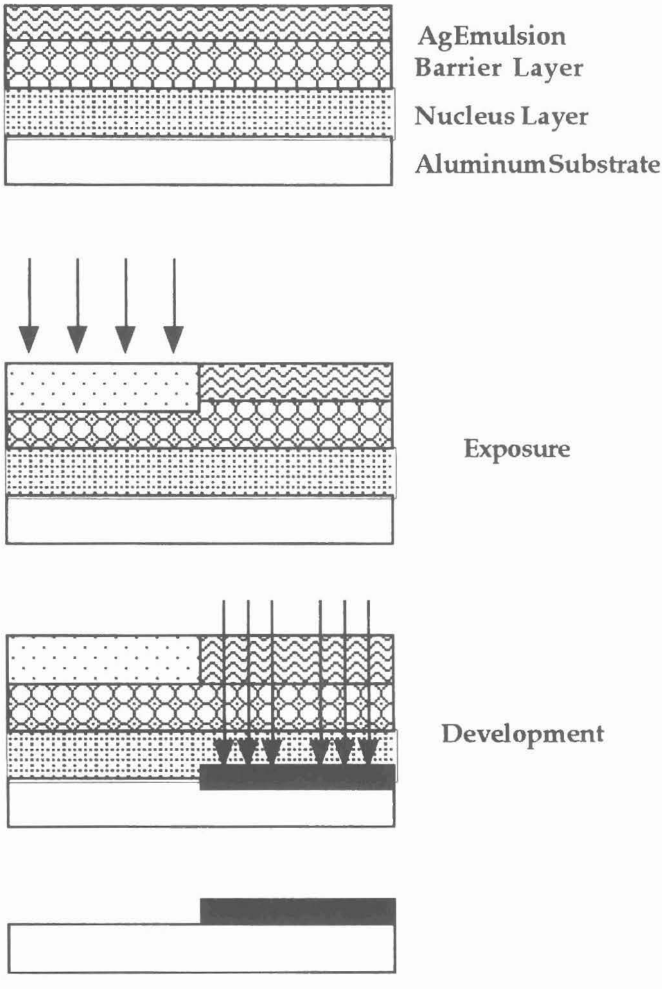


Figure 3. CTX YSP Positive Working Plate

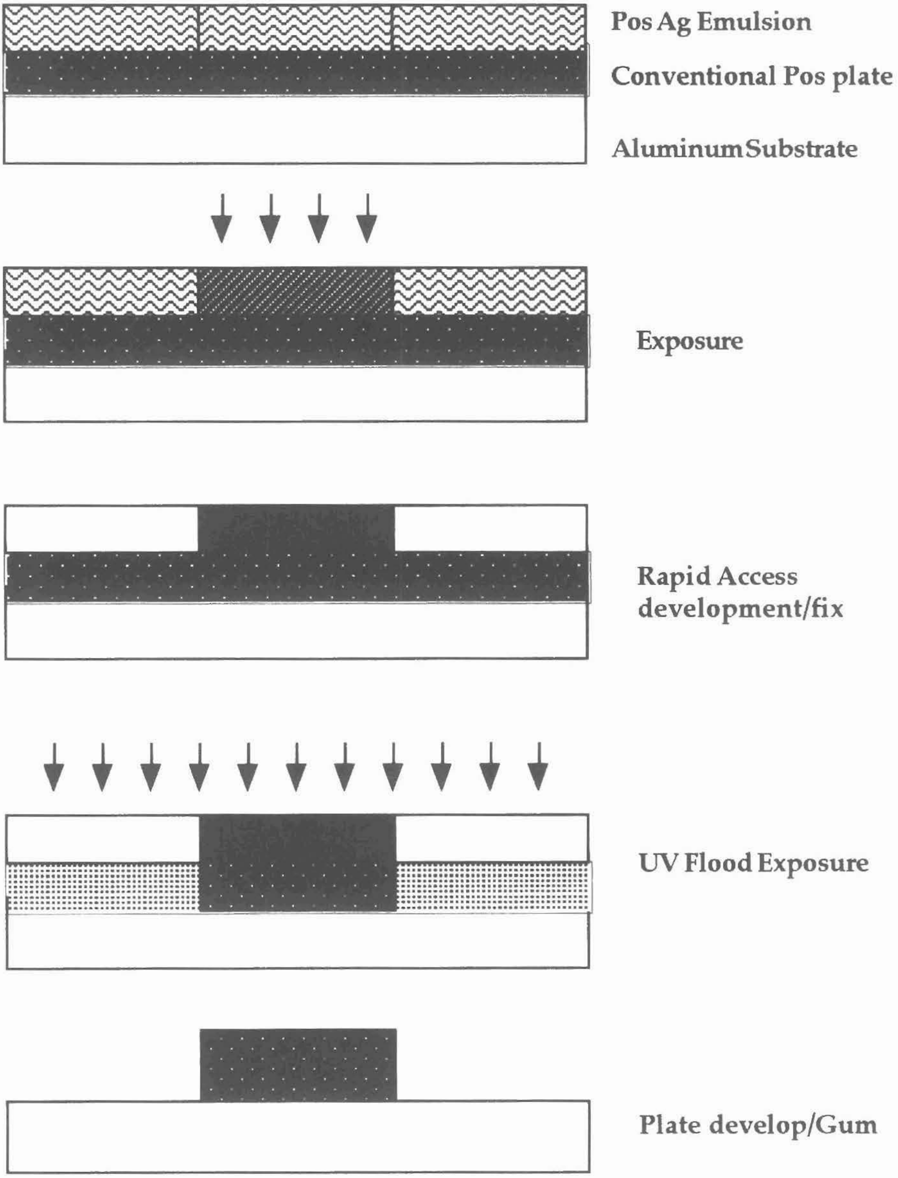


Figure 4 Thermal Crosslinking Preheat Plates
DI TPP 830, Quantum 830,

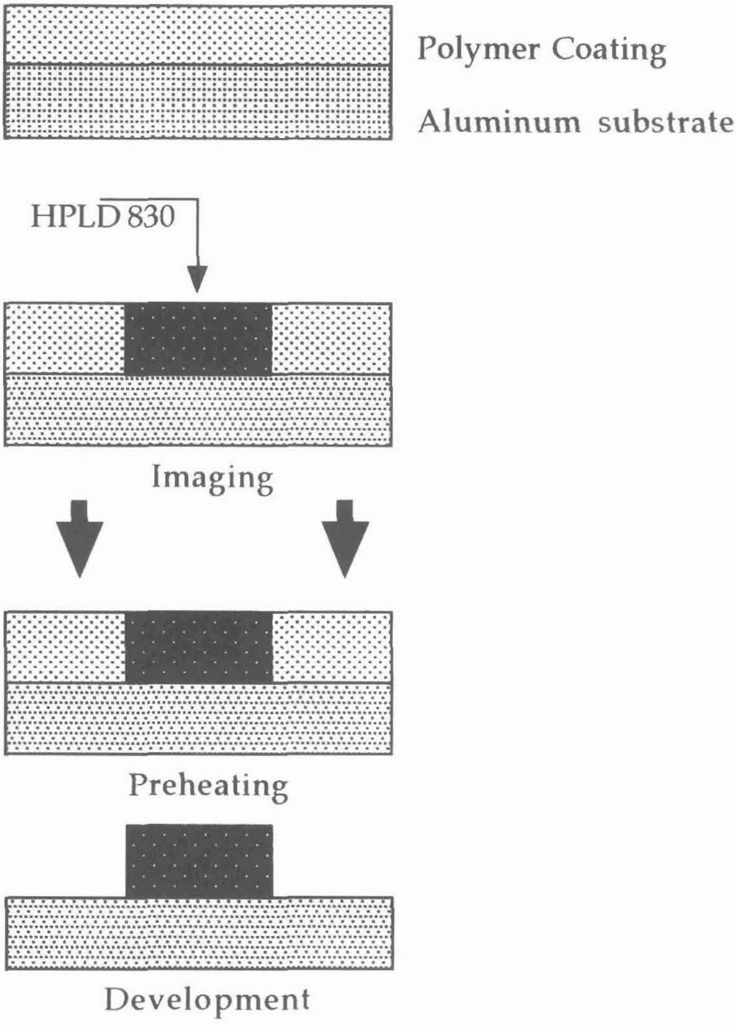


Figure 5 Thermal Non-Image Positive No Preheat
DI TPP IRx, Electra, Quantum PNPH, Thermostar

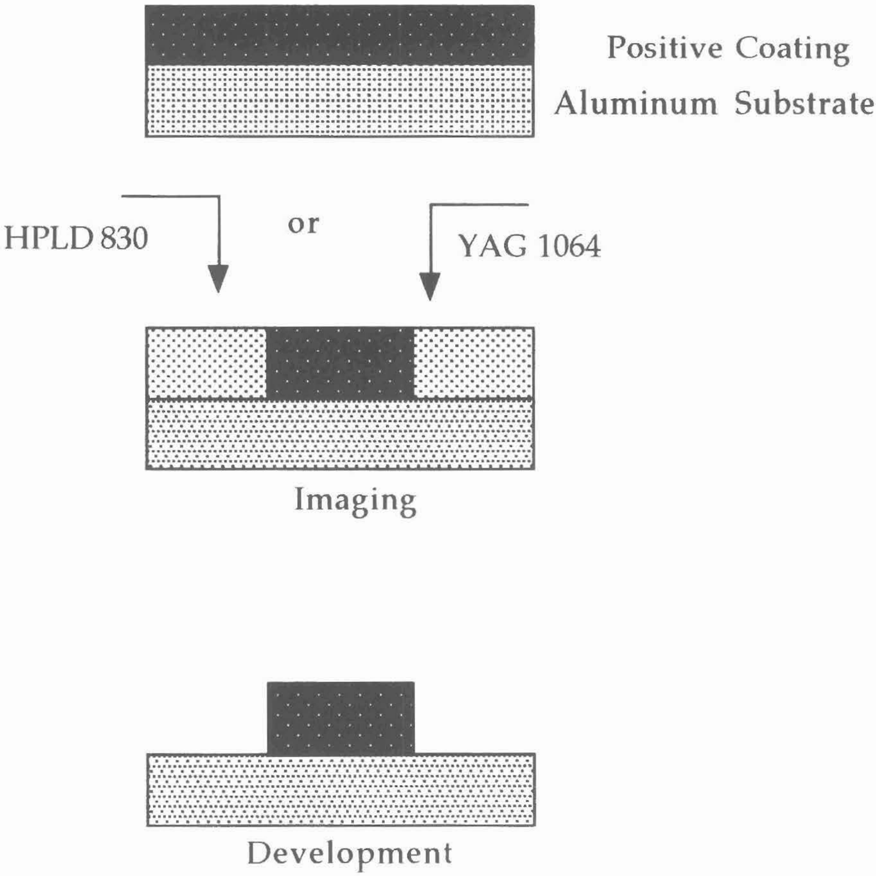


Figure 6 Thermal Ablative Silverlith SDT

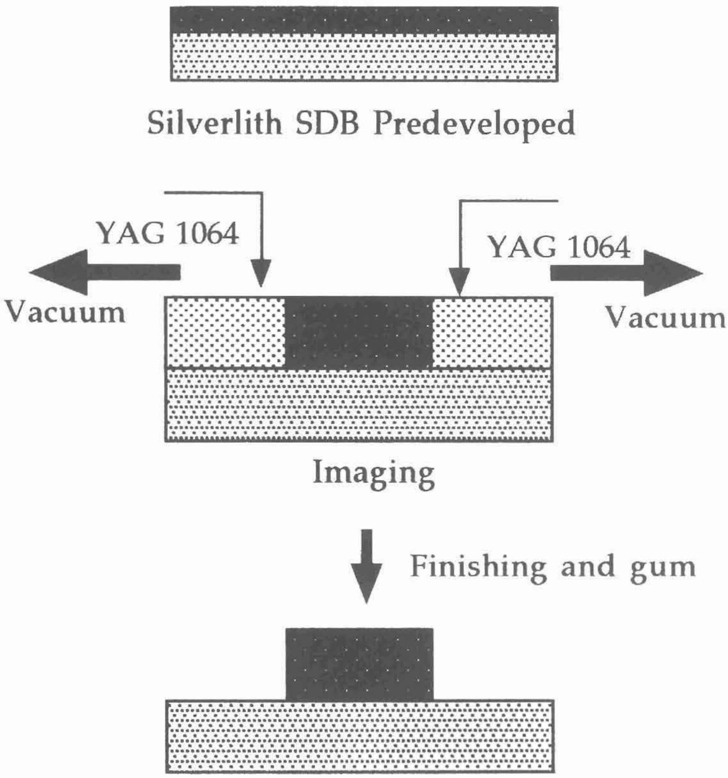


Figure 7. Quantum NPH Mask Technology

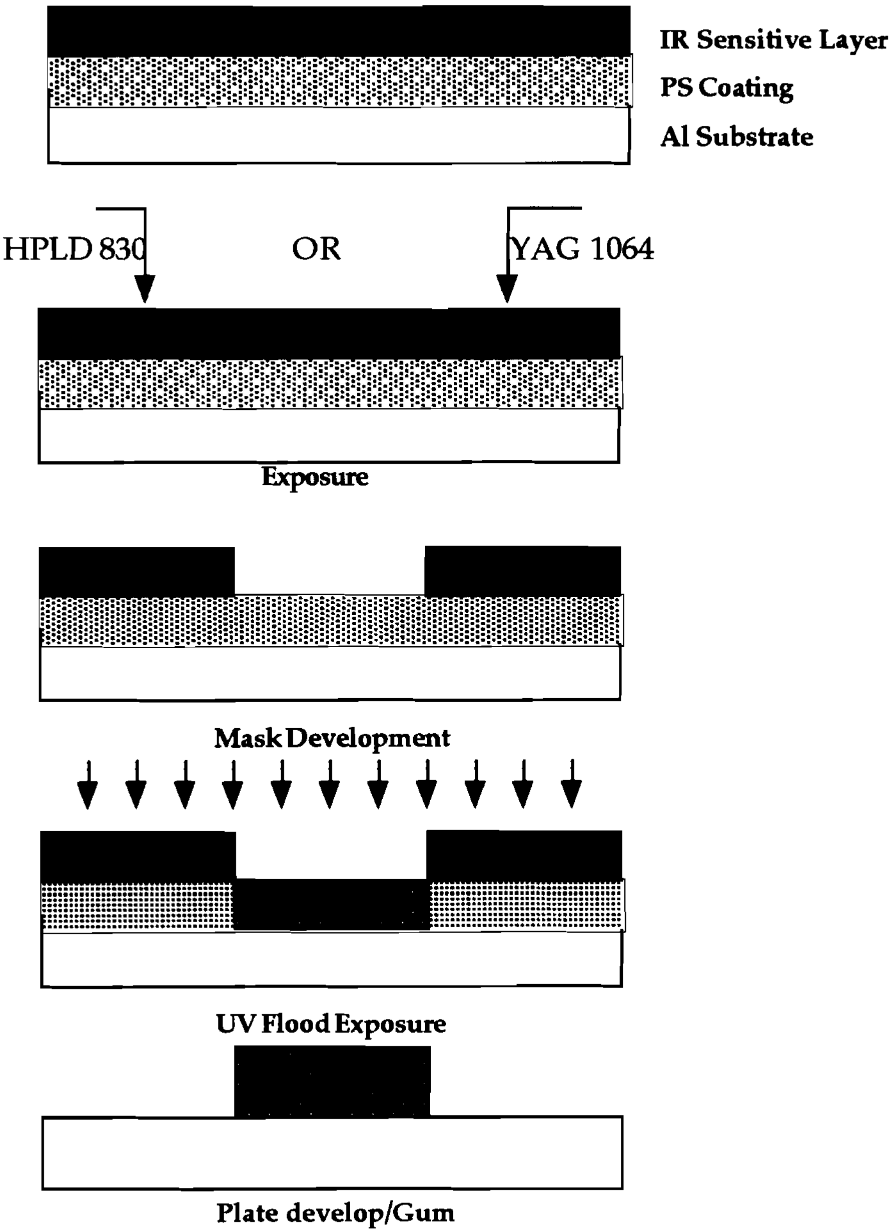
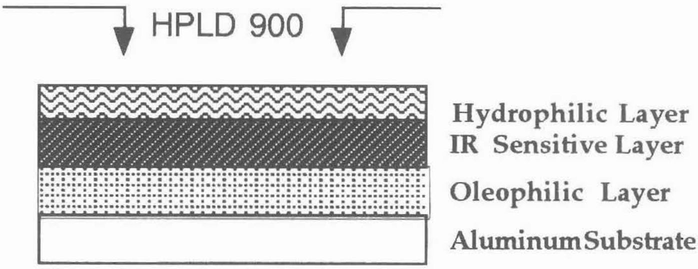


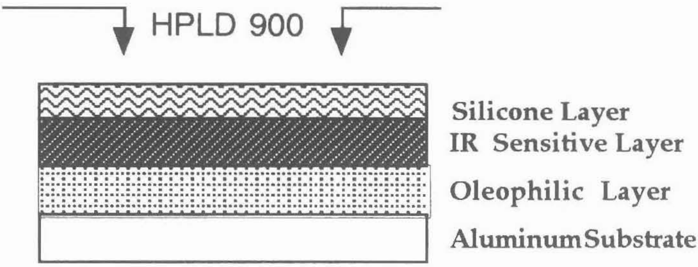
Figure 8. Thermal Ablative Plates-Presstek

Pearl Wet



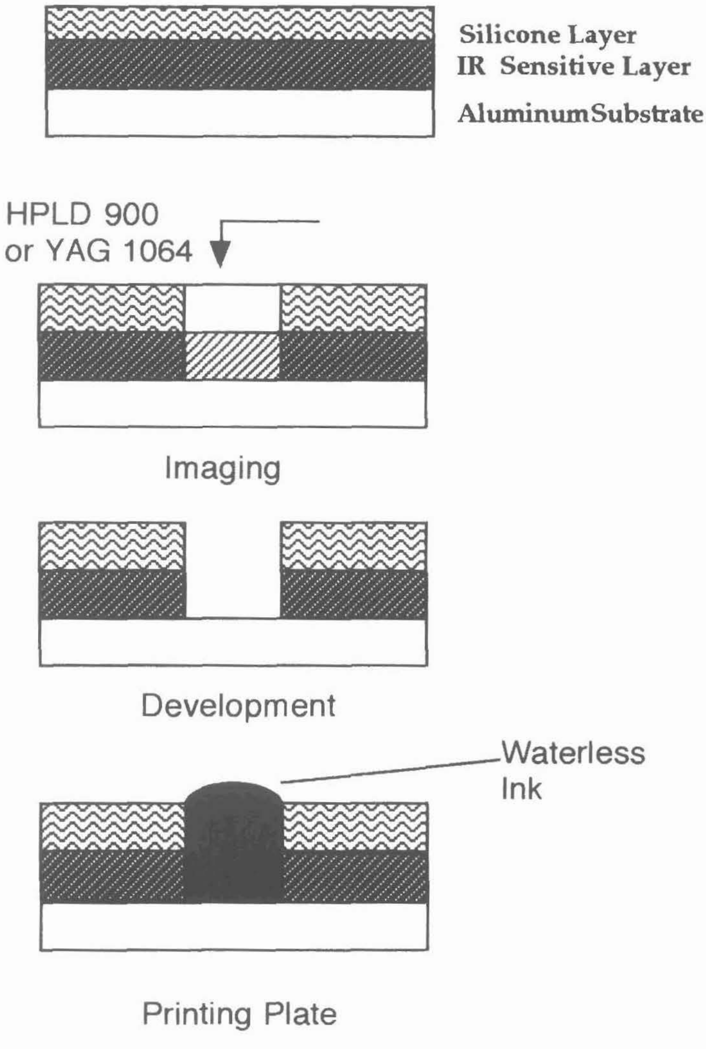
Note: Cleaning step after ablative imaging

Pearl Dry



Note: Cleaning step after ablative imaging

Figure 9. Thermal Non-Ablative Waterless Quantum NAW



References

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