The Plate Side of Computer-to-plate: Printability and Runnability

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Abstract: This presentation will focus on the findings at GATF that many of the thermal CTP plates printed in the last Tech Alert CTP study displayed either no gain, or even a slight sharpening, of the midtone physical dot area from plate to print. A study of the differences in the imaging mechanism did show a preponderance of sharpening for positive working plates. Further investigation into the physical dot structures of the plates, though, failed to reveal a physical characteristic of the dot or the coating that might account for this effect. To the contrary, it was observed that the physical structure of the coating did not play a significant role in decreasing the amount of physical dot gain traditionally attributed to the press. It is suggested from these observations that the surface chemistry of the hydrophilic and hydrophobic areas, as well as the press conditions (ink, paper, etc.) were primarily responsible for this effect.

Introduction

As part of a continuing series of CTP plate studies conducted by GATF on behalf of the graphic arts industry *(Hinderliter & Hutton, 1998; Stanton, 1996)*, thermal CTP plates were tested for their printability. These tests included analysis of the maximum resolution, midtone physical dot gain from plate to print, and dot imaging consistency. Of these, the most interesting and surprising results occurred when we studied the midtone physical dot gain. In this test, we discovered that the majority of the thermal plates exhibited virtually no physical gain. Some of the plates even showed a slight loss of physical dot area from plate to print. In an attempt to determine if there are any common characteristics on the plates which exhibited significant physical dot area loss, scanning electron microscope images were studied. This report will outline the results of that analysis.

This report is presented to inform the graphic arts industry of a finding which seems specific to a certain class of plates, namely thermal. Although the names of various plates are presented, this report is not meant to endorse any one plate over another. The specific brands are mentioned only in as far as they were used in the study which is cited in this report.

1997 Thermal Plate Study

The plates that participated in the 1997 CTP thermal plate study are shown in Table 1. The physical dot area was measured on the plates before printing and on the same area of the printed samples after the press run. Two measurement methods were used to quantify the physical dot areas. The first method simply traced the perimeter of the dots, photographed at 200X magnification, with a planimeter. For each plate at least four dots of the 50% tone were traced and the areas averaged to determine the actual physical dot area. The second method used PhotoShop software on scanned photographs of the dots taken at 50X magnification. For this method the gray levels of the pixels in the photograph were converted into a gray level histogram. The histogram tended to group the pixels into two primary gray regions. These regions were assumed to be the primary gray levels of the image areas and the non-image areas. A saddle point in the histogram between these two regions was assumed to be the transition gray levels at the border between the image and non-image areas. A point in the saddle was chosen as the cutoff point and the percentage of pixels above this point was calculated by the software. This was taken as the image area. It should be noted that the first method is generally considered the most accurate for measuring physical dot areas on plates. The same methods were used to measure the dot areas on the printed samples. Independent visual observations were later performed on the pictures of the plates and those of the printed samples to corroborate any of the results.

All of the plates were run on press over a two day period under the same printing conditions. The exact printing conditions are outlined in the Research Technology Report, *1997 Thermal Plate Study*, published by GATF *(Hutton, 1998)*. The press that was used was a Komori Lithrone six color 28 inch sheetfed offset press. The plates were run at 12,000 sheets per hour, on 80lb coated # 1 SD Warren Lustro Gloss paper with Wikoff WT100 ink.

The results were unexpected. Of the ten thermal CTP plates studied, four sharpened slightly from plate to print while three of the plates showed no conclusive gain or sharpening. Only two thermal plates exhibited a gain at the 50% dot from plate to print. Table 1 gives the physical dot areas of the 50% dot on both the plate and the printed samples, as measured by both methods. Table 2 gives the results of independent visual assessments of the photographs of the 50% dots magnified by 200X. For this table the judges were assessing whether the 50% dots looked like they sharpened or gained, overall, from the plates to the printed samples. When both the quantitative and the qualitative data corroborate each other then the observations made in this experiment can be given with a greater degree of certainty. In this study, the DuPont RD9 and the Quantum 830 were the only plates that gained when they printed. The rest of the thermal plates exhibited either a slight sharpening or no significant gain at all.

	Method #2 (Photoshop)					Method #1 (Sigma scan)				
	Plate	Error	Print	Error	Gain/Loss	Plate	Error	Print	Error	Gain/Los
Prisma 106	46.6	2.5	46.1	1.0	-0.4	49.0	2.2	43.5	3.6	-5.5
Thermosta	54.3	3.2	51.5	1.2	-2.8	52.2	2.4	46.4	1.8	-5.8
Viking GMX	58.1		61.6	1.1	3.5	56.5	3.4	56.8	3.4	0.4
Quantum 830	49.8	1.2	57.0	1.4	7.1	51.8	1.6	54.2	2.5	2.5
Fuji LH-P	53.1	3.2	50.8	0.1	-2.4	48.6	1.9	45.4	3.0	-3.2
Kodak DITP	51.7	2.0	51.0	0.9	-0.8	49.6	1.7	48.0	1.7	-1.6
Fuji LH-N	54.2	3.0	55.3	1.0	1.1	50.5	3.3	49.1	2.1	-1.4
DuPont RD9	53.4	0.9	59.1	0.5	5.7	51.1	0.5	54.3	1.3	3.2
DuPont ZP	46.5	0.8	46.5	0.7	0.0	45.5	1.6	41.4	1.8	-4.1
Electra DC	50.1	1.8	51.7	0.6	1.6	48.1	1.4	44.6	2.1	-3.5

Table 1. Gain/Sharpening occurring from the plate to the print.

	Visual Assessment	
	Judge #1	Judge #2
Prisma 1064	loss	0-loss
Thermostar	0-loss	loss
Viking GMX	gain	0-gain
Quantum 830	0-gain	gain
Fuji LH-P	0-loss	0
Kodak DITP	0-loss	loss
Fuji LH-N	gain	loss
DuPont RD9	gain	gain
DuPont ZP	loss	loss
Electra DC	0-gain	gain

Table 2. General visual assessments of dot gain or loss from plate to print.

Subsequent scanning electron microscope (SEM) images were taken on eleven plates to determine if there are any physical characteristics common to the plates that sharpened. The eleven plates are listed in Table 3. The SEM images were made on a CamScan Maxim, with hard copy output on a Kodak 8650 PS printer *(Ref. 3)*. Of these eleven plates two were imaged by non-thermal CTP systems, one was imaged conventionally with film, and eight were imaged by a thermal CTP system. Images were captured at 75 degrees tilt angle and straight on view. Most of these images are shown in Figures 1-12. The caption for each of these figures shows the plate, magnification, capture angle and the amount of dot gain/sharpening which occurred on press as measured by method #1.

Plate	Type of Plate
Prisma 1064	Thermal CTP
Thermostar	Thermal CTP
Viking GMX	Film imaged
Quantum 830	Thermal CTP
Fuji LH-P	Thermal CTP
Kodak DITP	Thermal CTP
DuPont RD9	Thermal CTP
DuPont ZP	Thermal CTP
Electra DC	Thermal CTP
DuPont SDB	UV CTP
CTX	UV CTP

Table 3. Plates analyzed with a scanning electron microscope

Results and Discussions

No doubt, advances in press, blanket, and ink formulations have contributed greatly to the dot sharpening/no gain effect, although, since these conditions were the same for all of the plates studied, differences in the various plate surfaces must be credited for the large differences in dot gain/sharpening occurring on press. In analyzing the SEM images, trends, similarities and differences in the topographical characteristics were noted to determine if characteristics such as coating thickness or edge gradient played a significant role in sharpening or increasing the area of the dot. Other characteristics of the thermal plates were also looked at to determine if any trends or similarities existed. These were the platesetter type and whether the plate was a positive or negative imaging plate.

In this study the Prisma 1064, DuPont ZP, Agfa Thermostar, Fuji LH-P, and Kodak DITP exhibited either physical dot area sharpening or no change of physical dot area from the plate to the print. Within this group, four were positive working (write background) plates and one was a negative working (write image) plate. For the two thermal plates that gave a definite gain from plate to print, both were write image plates. Of the two plates which showed conflicting data as to whether they gained or sharpened, the Fuji LH-N and Horsell Electra DC, one was a positive plate and the other a negative plate. In short, none of the write background plates conclusively gained, while only one of the write image plates exhibited definite sharpening. Some of this sharpening may be attributed to the "write white" effect, where the more pointed outer corners may be truncated by the fountain solution due to surface tension. For images such as that found on the Prisma 1064, Figure 3, this might be an explanation. But the shape of the dots in Figures 2 and 4 are the same as those in Figures 1 and 5. Whereas the former sharpened significantly, the latter gained.

Analysis of the physical dot structures in Figures 6 - 10 shows that neither coating thickness nor the steepness of the edge on the coatings solely determine the amount of sharpening that may occur. The coatings on the DuPont ZP and Prisma 1064 plates are indistinguishable from the grained aluminum substrate, while the coatings on the Fuji LH-P, Agfa Thermostar, and Kodak DITP are thick relative to the grained substrate. The edge steepness doesn't seem to have a significant effect, either. The plate that gave the strongest sharpening of physical dot area, the Agfa Thermostar, is not as steep as either the Fuji LH-P or the Kodak DITP. For the two plates that gained, Figures 11 and 12, the physical structure of the coating is similar to that of the Agfa Thermostar.

When SEM images of the non-thermal plates are compared to the thermal plates no distinguishing differences in edge resolution or dot shape was observed.

As far as platesetter/imaging lasers are concerned, it was observed that approximately half the plates imaged on a CREO platesetter with an 830 nm LED laser gained. The other half either sharpened or exhibited no gain at all. It is interesting to note that all three plates imaged with a 1064 nm NdYAG laser sharpened. Although, all of these plates were also write background plates. Unfortunately, a sample population of three is too small to draw any conclusions.

Conclusions

It is clear from the SEM images that the physical structure of the plate coating has little effect on the amount of physical dot gain or sharpening occurring from the plate to the print. The surface chemistry of the hydrophilic and hydrophobic areas play a more significant role in determining the amount of dot spread or shrinkage when the plates are taken to press. Some interesting observations that warrant more study, though, are the amount of positive working plates that sharpened. Although the population in this study was statistically small, these plates did show an overwhelming preponderance towards sharpening.

There are a number of plates on the market that can be imaged conventionally and through a thermal CTP system.. The next obvious step if to determine whether a significant difference can be observed for the same plate imaged both ways. As an example, the Kodak DITP and Kodak 2916 can be tested under the same press conditions to determine if a difference in the physical dot gain occurs at the press. Since both plates are the same, any difference would indicate that the imaging method affects the surface characteristics of the plate.

For conventionally imaged plates the total tone value increase (optical plus physical dot gain), as measured with a status T densitometer, at the 50% dot generally runs between 18-24 percent. Conventional wisdom attributes about half of this to physical gain occurring on the press and at the exposure of the plate. The other half is thought to be due to light scattering within the paper. In this study no significant physical dot gain occurred on the press. Even the conventionally imaged plate, the Imation Viking GMX, showed no physical gain from plate to print. The plates imaged by computer-to-plate systems exhibited insignificant gain during the exposure process. In this study the status T TVI for the thermal plates ranged from 5-10 %, well below the industry norm.

When combined with the lower dot gain occurring at the press, it is easy to see that, as the industry moves towards greater utilization of computer-to-plate, normal TVI will decrease significantly. At first glance this may seem to be a blessing for the graphic arts industry. However, the industry has adjusted to the dot gains observed on conventional plates. Many of the industry standards and guidelines specify dot gains which were derived from printing with conventional plates. These specifications are well above the dot gains found in this study. There are also a great many printers in the industry who use conventional plates. Some of these printers must print the same file with both conventional plates and CTP plates. Since conventional plates are incapable of matching the lower dot gains found on thermal plates, and inertia will undoubtedly prevent the industry from changing the guidelines and standards anytime soon, it will be necessary for platesetters to add dot gain to CTP plates, to match the rest of the standards in the industry.

Literature Cited

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1996 "GATF Computer-To-Plate Studies", Graphic Arts Technical Foundation

Ref. #3
ComScan USA Inc., 508 Thomson Park Drive, Cranberry Township, PA 16066-6425

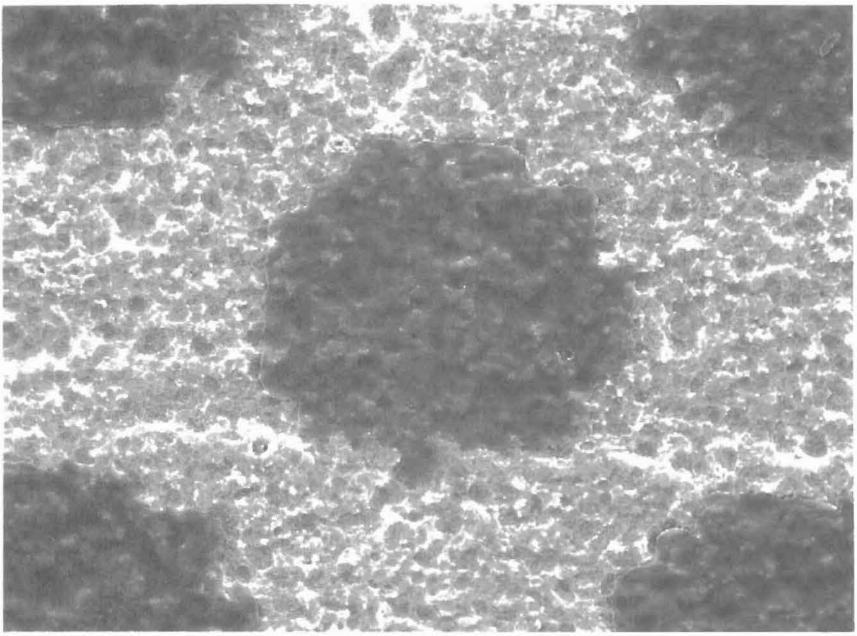

Figure 1. DuPont RD9 500X Top View Gained (3.2%)

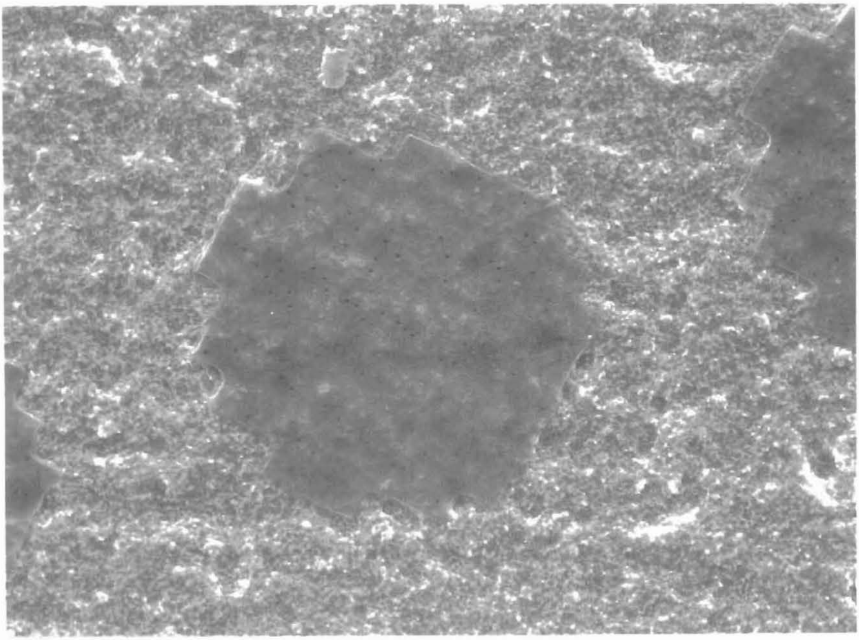

Figure 2. Fuji LH-P 500X Top View Sharpened (-3.2%)

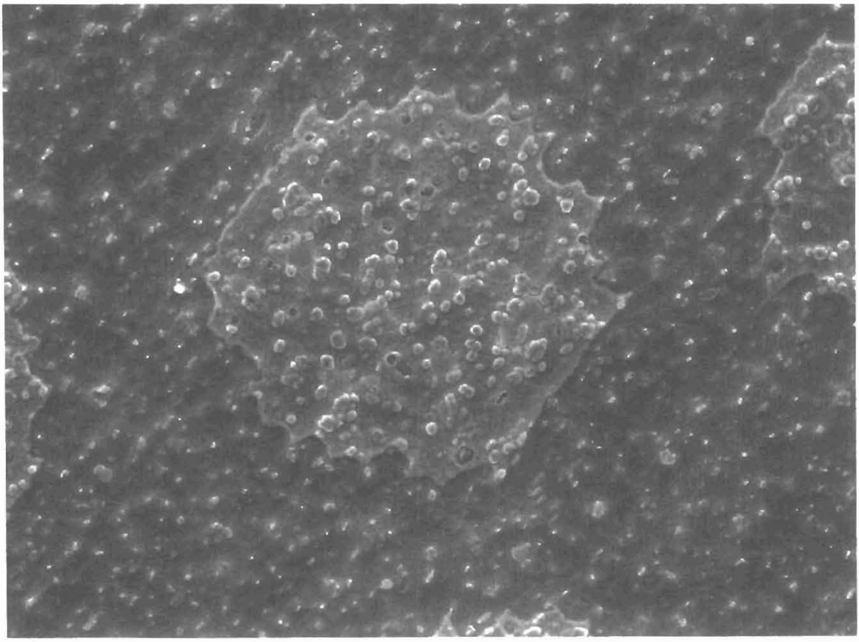

Figure 3. Prisma 1064 500X Top View Sharpened (-5.5%)

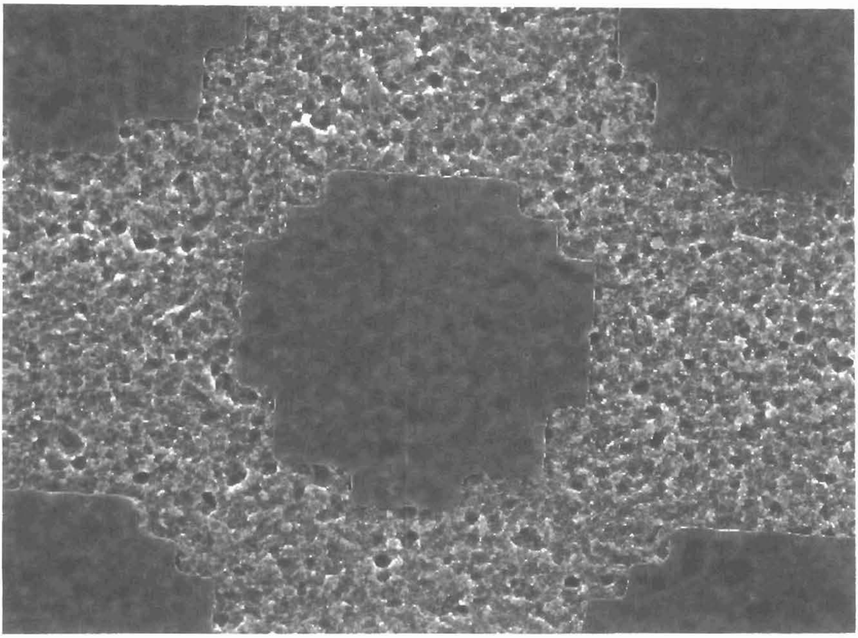

Figure 4. Kodak DITP 500X Top View Sharpened (-1.6%)

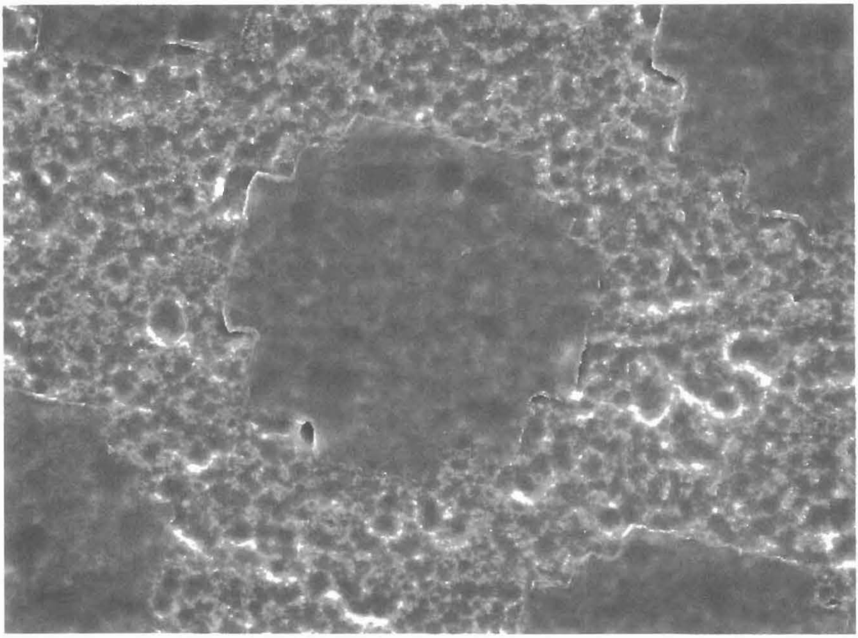

Figure 5. Quantum 830 500X Top View Gained (2.5%)

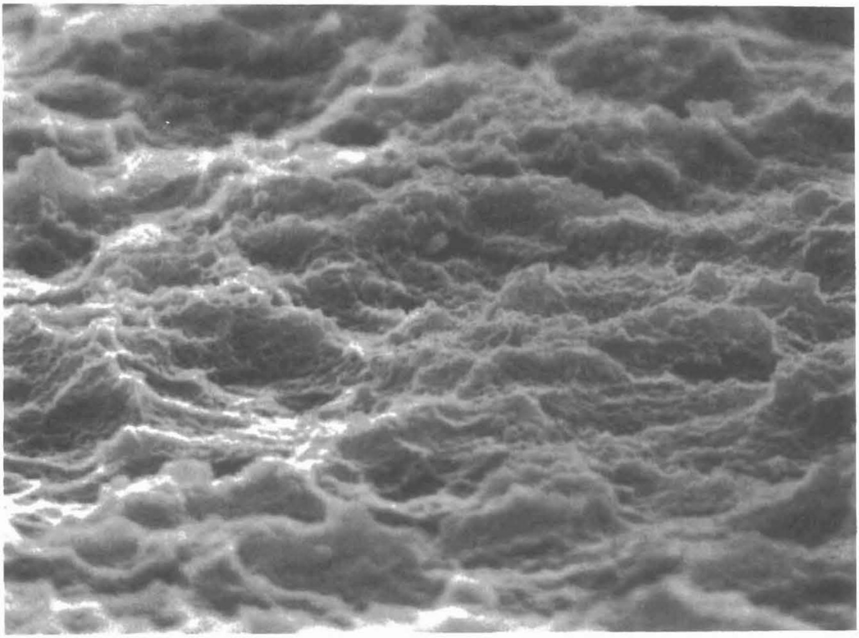

Figure 6. DuPont ZP 5000X 75° Tilt Sharpened (-4.1%)

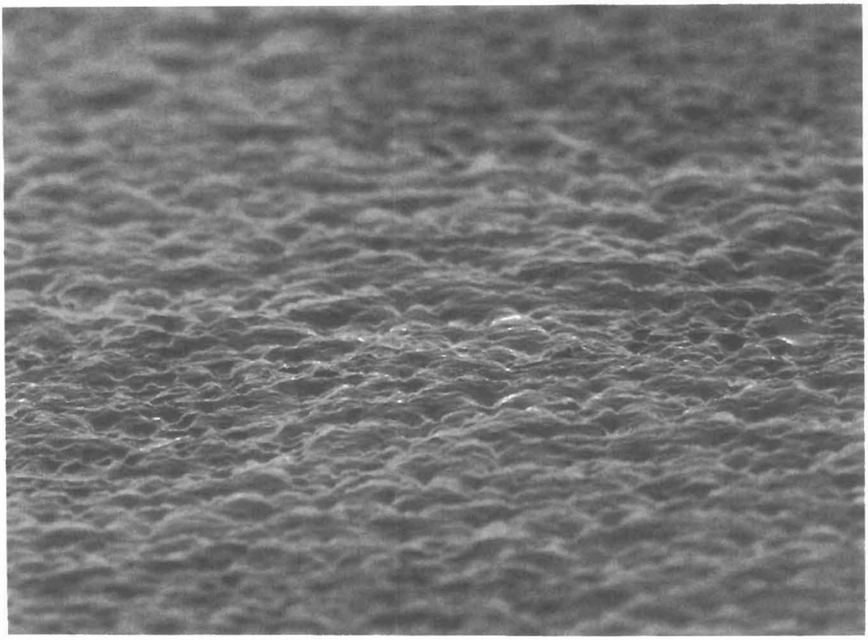

Figure 7. Prisma 1064 1000X 75° Tilt Sharpened (-5.5%)

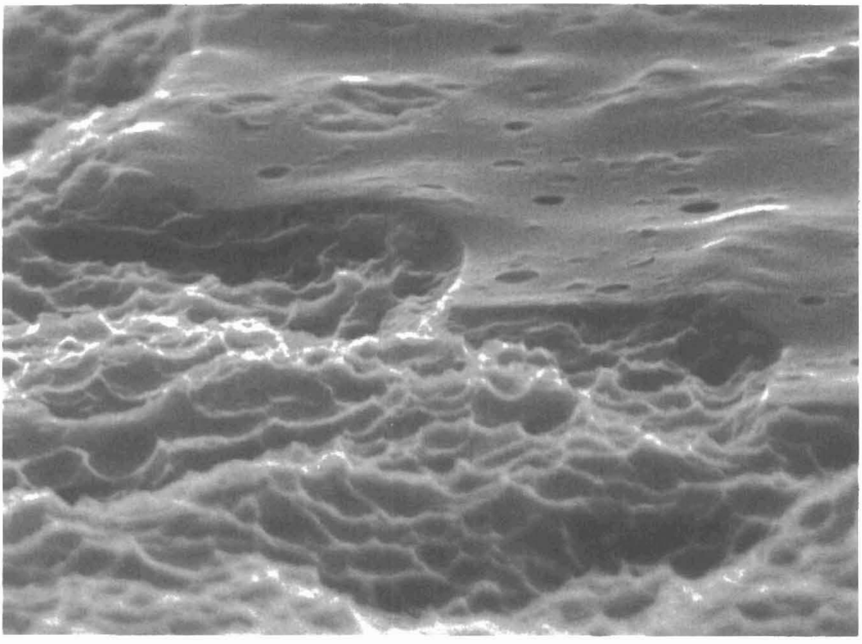

Figure 8. Fuji LH-P 5000X 75° Tilt Sharpened (-3.2%)

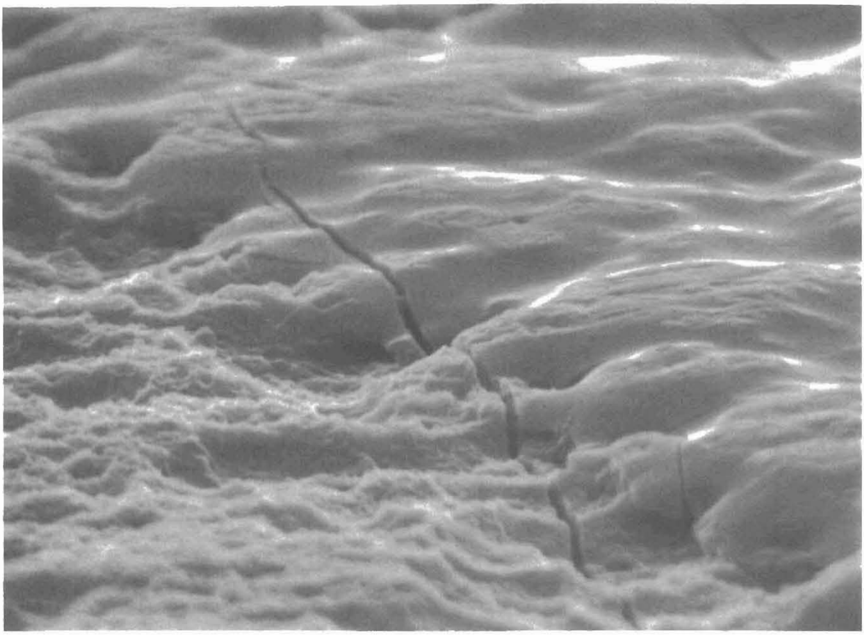

Figure 9. Thermostar 5000X 75° Tilt Sharpened (-5.8%)

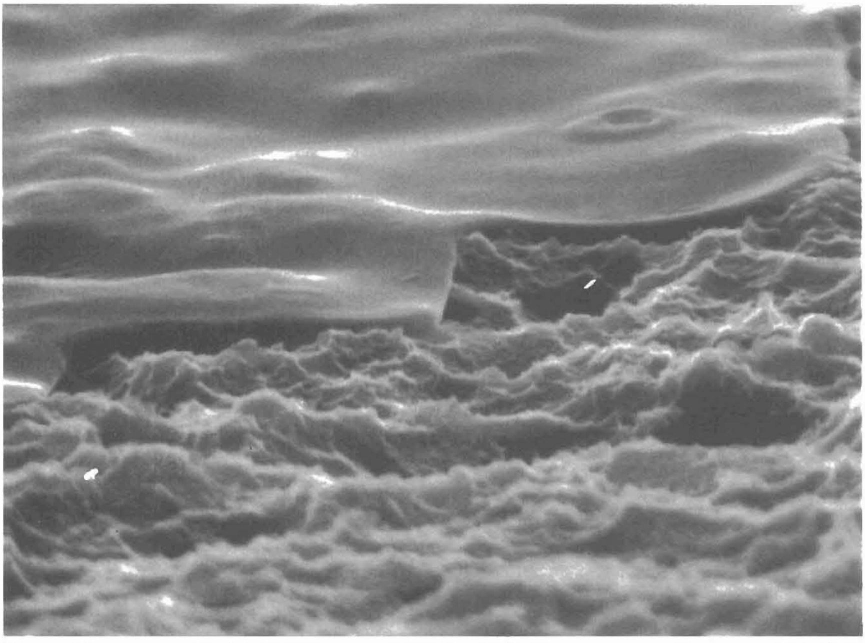

Figure 10. Kodak DITP 5000X 75° Tilt Sharpened (-1.6%)

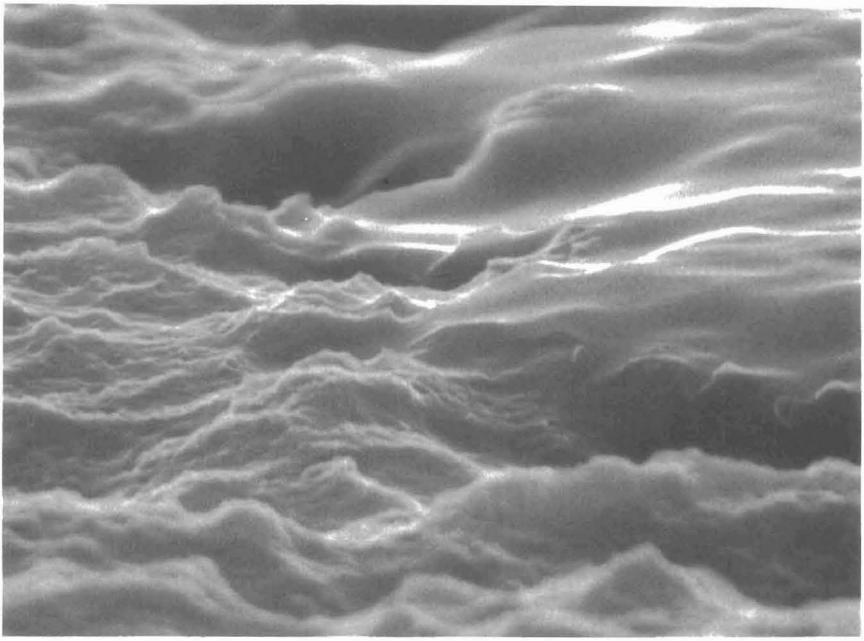

Figure 11. Quantum 830 5000X 75° Tilt Gained (2.5%)

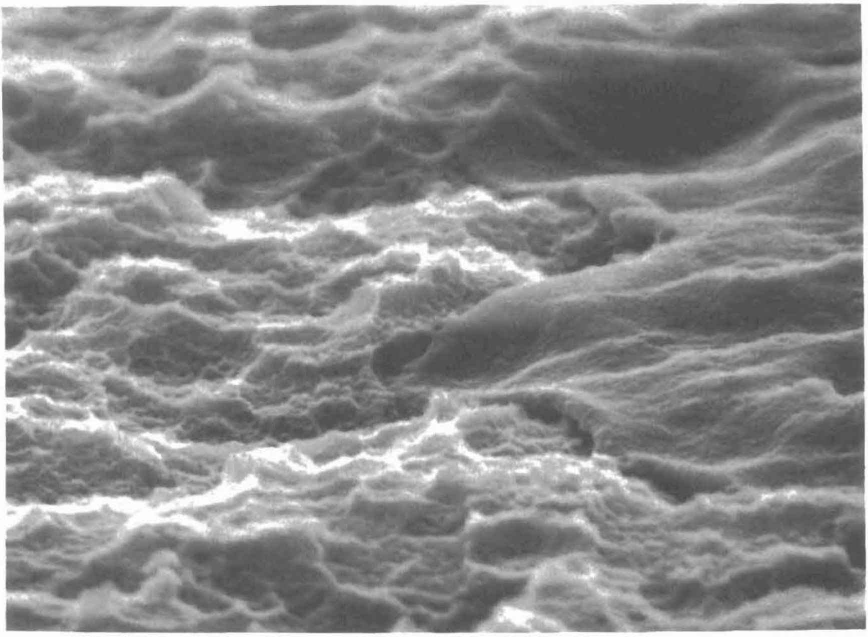

Figure 12. DuPont RD9 5000X 75° Tilt Gained (3.2%)