CHAPTER 3

EXPERIMENT

3.1 Materials

3.1.1 Three types of carrier namely A-3, F-200, and Iron Shot carrier.

3.1.2 Three types of negative CCA namely type A, type B, and type C.

3.1.3 Toners with different wt% of CCA.

3.2 Apparatus

Rolling type of toner charge (home made).

Blow off q/m measurement unit (home made) with TOSHIBA VC-Z11L 160 cleaner.

Printer for testing toners: OKI 400 micro line CL.

E-SPART analyzer from the joint development of Hosokawa Micron Corporation and the University of Arkansas: EST-1

Developing unit of printer, OKI 400 micro line CL, for charging toner.

Electrometer from KEITHLEY, Ohio, USA.: 617 Programmable electrometer.

Electronic balance from SHIMADSU Corporation: AEX-120 G Analytical balance.

Densitometer from Macbeth Corporation: RD915

3.3 Procedure

3.3.1 *Preparation of toners*

The toners, which were prepared by Tomoegawa Paper CO., LTD in Japan, are different in component, shape, CCA types, and CCA wt%. They are shown in the following:

Toner name	*CCA types*	*wt%*
KT-04a	-	0
KT-04b*	-	0
KT-05a	A	1
KT-05b	A	1
KT-06b	A	2
KT-07b	A	3
KT-08b	A	0.25
KT-09b	A	0.5
KT-10b*	-	0
KT-11b	B	0.25
KT-12b	B	0.5
KT-13b	B	1
KT-14b	B	2
KT-15b	B	3
N-09C (irregular shape)	C	2.4
N-09S (spherical shape)	C	2.4

a = have no silica, b = have silica, * = different lot number

3.3.2 *Measurement of charge properties by three types of charging mechanism*

3.3.2.1 Charging properties by a rotation-charging

The toner 1 gram and carrier 19 grams were mixed together in a cylindrical roller at a rotating speed 120 rpm. The rotating roller was stopped for 1, 2, 3, 5, 10, 20, 40, 60, and 90 minutes in order to measure q/m values by a blow off measurement unit that was connected to an electrometer and a cleaner. The mixture of toner and carrier were poured carefully into a cage of a blow off measurement unit, which had a metal mesh size of 25 micrometers on the bottom, to make a uniformed layer of toner. The cage with the mixture was weighed by an electronic balance. The toner was blown off for 15 seconds, and q values were read from the electrometer. The cage was weighted again to get a weight for the toner mass, which was lost by the air blow, then the q/m ratio was calculated.

3.3.2.2 Charging properties by a printing-charging

The toner was poured into a developing unit of the printer. The printer was warmed up and the toner was charged for 24 seconds. The case of developing unit was taken out to connect to an electrometer. The toner was sucked out from the developing roller by a cone of the blow off measurement unit, which was weighted by an electronic balance, for 15 seconds and q values were read from the electrometer. The cone was weighted again to get toner mass, then the q/m ratio was calculated.

3.3.2.3 Charging properties by a hand shaking charging

The toner 1 gram and F-200 carrier 19 grams were mixed together in a cylindrical roller by hand shaking for 1 minute. The mixture was poured smoothly into a cage of the blow off measurement unit, which had a metal mesh size of 25 micrometers on the bottom, to produce a uniformed layer of toner. The cage with the mixture was weighed by an electronic balance. The toner was blown off for 15 seconds, and q values were read from the electrometer. The cage was weighted again to get a toner mass value, which was lost by air blow, then the q/m ratio was calculated.

3.3.3 *Measurement of charge properties by the E-SPART analyzer*

The toners namely, KT-04b, KT-05b, KT-07b, KT-10b, KT-14b, N-09C, and N-09S, were selected to measure charge by the E-SPART analyzer. First, the toner 1 gram and F-200 carrier 19 grams were mixed together by a cylindrical rotating roller for ninety minutes. Then, the toner charge was measured twice by the E-SPART analyzer.

3.3.4 *Evaluation of print quality*

The toner was poured into a developing unit of the printer, which was separated into four parts. Five plain paper sheets were printed by using a test form, which was produced by the fifth Aldus Pagemaker program for Macintosh. Each sheet was consisted of four toner types, which were arranged in a horizontal

direction. The print-outs were measured for solid density, background density and dot gain percentage by a reflection densitometer.

3.3.4.1 Measurement of solid density

The print-outs were measured for their density at the solid areas by a reflection densitometer, which was calibrated with black and white tiles.

3.3.4.2 Measurement of background density

The print-outs were measured for density at non-printed areas by a null density mode of the reflection densitometer. The null density mode was calibrated to be zero on paper surface. Therefore, the obtained density values, which were excessive, were defined as background density that was unwanted for an electrophotography.

3.3.4.3 Measurement of dot gain percentage

The print-outs were measured for dot area percentage at tone reproduction areas, which were consisted of 0, 10, 20, 30, 40, 60, 80, and 100 %, by a reflection densitometer. The reflection densitometer calibrated on the paper surface was zero and was assumed to be one hundred percentage on a highest solid density area of print-outs. Then, dot gain percentage of print-outs by various toners could be compared.