CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

This research studied the conductive toner cloud confinement using the lower electrode, which was dented to a cone shape and another electrode of the ITO glass for observing the toner motion between the electrodes. Three types of the conductive toner were each sprayed freely on the cone-shape dented electrode and the voltage was applied to the electrodes. The conductive toner cloud confinement condition was carried out by measuring the diameter of the conductive toner cloud at the toner cloud state and measured the toner jumping current between the electrodes. Furthermore, we investigated the dependence of the toner diameter and the toner jumping current on various influencing factors. These factors were the toner amount, the applied voltage, the toner characteristic resistivity, and the cone depth of the dented electrode. In addition, the toner jumping trajectory was calculated by the ELFIN software.

Conclusions

When a certain value of the electric field was applied between the electrodes, the conductive toner starts to move up and down between the electrodes by the electrostatic force. We can observe the conductive toner motion by the ITO glass. At the toner cloud state, the conductive toner on the dented electrode is out of sight and becomes like a black cloud that the electric force carries the toner component toward the central axis of the dented electrode. Investigation of the dependence of the toner cloud extent on the toner amount, at three values of the toner characteristic resistivity

was carried out. It was found that the increase in the toner amount leads to the larger toner cloud extent by the lower resistivity toner. On the other hand, the smaller the toner cloud extent was found in the high resistivity toner. The toner cloud extent decreases with increasing applied voltage. For the depth of the cone-shaped dented electrode, the smaller toner cloud extent, the larger the depth of the dented electrode.

In addition, the effect of applied voltage was additionally studied for toner jumping current. It was found that the toner jumping current depends on the toner amount. When the toner amount increased, the toner jumping current also increased. Likewise, the applied voltage to the electrodes was higher, the toner jumping current was also increased. The deeper the dented electrode, the greater the toner jumping current. Moreover, the toner characteristic resistivity is another parameter in the toner jumping current. The lower resistivity toner gives the higher toner jumping current.

The ELFIN software is used to simulate the toner trajectory in the electric field, which can estimate the position of the conductive toner moving between the electrodes. The ELFIN software can create the toner cloud profile. Therefore, the simulated results show that the deeper the dented electrode and/or the higher the applied voltage, the smaller the toner cloud extent. Further, we found that the simulated results are in good agreement with the experimental results.

To the technological conclusion, we achieved the conductive toner cloud confinement technique for toner transport mechanism measured in terms of toner jumping current. This information could possibly be applied to improvements of the dot formation mechanism in a modern electrostatic toner jet printer.

Suggestions

Many more important parameters for conductive toners as per toner cloud confinement are not yet thoroughly investigated. A few of the parameters are mentioned below:

a) Effect of ambient humidity,

b) Adhesion force between the toner and the electrode,

c) Type and shape of the two electrodes in relation to the electric field,

d) Shape of the dented electrode, such as lens shape, zig zag pattern, etc.

These parameters indeed affect the extent of toner cloud confinement, toner jumping current and toner trajectory.