THE SUMMARY OF Ph. D. DISSERTATION

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Title

Dynamics for Microfluid and Dispersed Particles Used in Liquid Toner Electrophotography

Abstract

Liquid toner electrophotography (wet process) is expected for the future printing process because of the high quality images and the low running cost. But, there are some uncertain properties and phenomena in the wet process. In this study, two technologies for the wet process are taken up particularly. One is the shearing transfer that is an innovative method, and the other is the noncontact squeegeeing device that has been used conventionally. Those technologies are concerned with the phenomena of the micro size liquid and the colorant dispersed in it, but those working principles were not realized. Many techniques such as the Finite Element Method (FEM) and the equational analyses have been used to clarify the phenomena and the working principles.

With this study, the following features have been explained.

(1) The principle of the shearing transfer is not the effect of the adhesive force and the tucking force of rubber but the elastic force and the friction force of rubber that is the reason to be affected by surface energies of materials.

(2) And the principle of the noncontact squeegeeing device is the effect of the sucking force caused at the meniscus that balances with the hydrodynamic negative pressure, on the condition of an appropriate roller speed.

Moreover, it became possible to explain the reason why the good quality images are reproduced in the liquid toner electrophotography.

The microfluidic phenomena and the analytical techniques used in this study will be important to develop the future printing technologies. And, it may be that these results will be used to the microfluidic system chips for peculiar applications.