Control of Surface Charge Density of Micro-Toner for High Resolution Imaging

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***Abstract*— High resolution electrophotographic image development with 1200 DPI requires the use of fine toners with a controlled size distribution in the range of 3 to 5 μm in diameter and a uniform and narrow electrostatic charge distribution with a high q/m ratio. Absence of any significant amount of wrong sign toner is desired. The energy intensive jet milling used for grinding in the traditional manufacturing process produces toner with a high surface energy density and a high electrostatic surface charge on each particle. Charged particles with both negative and positive polarities form agglomerates in the milling process and the high surface energy on the particles generates non-uniform surface states and increased hygroscopicity. Surface states are created by the physisorption and chemisorption of gases and vapors on the surface of individual particles during the jet milling process. While the surface states are recognized as the governing factor for the effective Fermi level of each particle, very little is known on how to control the surface states to obtain the desired work function of insulating particles. Until now, application of surface additives on both toner and carrier is the only method used extensively for minimizing non-uniformity of toner charge distribution. Both fundamental research and experimental studies are needed for obtaining the desired uniformity and magnitude of charge distributions. This paper presents a brief description on the generation of surface states and on how the surface states and the surface structure determine the charge exchanges during tribocharging of two-component toner. Possible methods for controlling surface states and for minimizing non-uniformity of charge distributions are suggested. Needs for a real time monitoring of the size and charge distributions both during the manufacturing and mixing processes are elucidated.**