A Nodal Model for Non-Linear Conduction in Toner Particles Modified with Conductive Additives

Vladislav Skorokhod
Xerox Research Centre of Canada
Mississauga, Ontario, Canada

Abstract

Conductive toners utilized in some single- and dual-component development systems can be formulated by dispersing fine conductive additives on the surface of insulative toner particles. Electrical conductivity of such toners depends not only on intrinsic conductivity of the additives, but also on their dispersion on toner surface, and, to a great extent, on the method of conductivity measurement.

The present model describes electrical conductance of an individual toner particle with a sub-monolayer of fine conductive additives dispersed on its surface. The model is based on an equivalent electrical circuit consisting of nodes assigned to individual additives, and non-linear resistors representing percolation currents between the additives. Non-linear current-balance equations constructed for each node were solved numerically to obtain the overall current-voltage response of an individual toner particle as a function of the size, volume fraction, and level of dispersion of the conductive additives. Experimental verification of the present model and methods of toner conductivity measurements will also be discussed.

Biography

Vladislav Skorokhod received his B.S. in Electrical Engineering and a *Kandidat Nauk* degree in Solid State Physics from Ukraine, and a Ph.D. in Materials Engineering from Queen's University, Canada. His work in Xerox Research Centre of Canada has focused on the physical methods of toner and developer design and characterization. His interests also include physical properties, microstructure and processing of particulate and ceramic materials for structural and electronics applications.