

インクジェットインクの乾燥過程における レオ・インピーダンス挙動

Rheo-Impedance Behavior During the Drying Process of The Inkjet Ink

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Abstract

Pigment-based inks provide sharper contours than dye inks but are susceptible to nozzle clogging during inkjet printing. To clarify the mechanism, the rheo-impedance behavior of a commercial black pigment ink (water content: 75.8%) was analyzed during drying. A fixed droplet was placed on a rheometer plate, and dry air (70 cc/s) was supplied while monitoring both weight loss and rheo-impedance. The drying process consisted of three stages—region I (constant rate), region II (falling rate), and region III (final rate)—with transition points at approximately 60% and 28% residual mass, independent of temperature. The storage modulus G' and impedance Z increased sharply as solvent evaporation progressed, reflecting particle aggregation and the loss of ionic conduction through the water phase. Even at identical water contents, higher drying temperatures resulted in larger G' and smaller Z , indicating the formation of a more rigid and electrically continuous structure governed by differences in water distribution. These results demonstrate that rheo-impedance analysis captures the coupled mechanical and electrical evolution during drying and provides a quantitative basis for understanding aggregation dynamics related to nozzle clogging and for optimizing drying conditions to suppress clogging and improve film formation.

キーワード：インクジェットインク、レオ・インピーダンス、乾燥過程、動的粘弾性

Keywords : Inkjet-ink, Rheo-Impedance, Dry process, Dynamic viscoelasticity

1. はじめに

インクジェット印刷技術は、非接触で微小な液滴を高精度に吐出できることから、家庭用や

オフィス用プリンターにとどまらず、電子デバイス製造、バイオ分野、塗装・コーティングプロセスなど、多様な産業分野で応用が拡大している。インクジェット用インクには大きく分け

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