UV Light Extinction Imaging Method for Monitoring Inkjet-Printed Organic Layer in Thin Film Encapsulation Process

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Abstract. Organic thin layers are highlighted as crucial components of flexible and printed electronic products due to their ability to provide mechanical flexibility in various applications, such as flexible displays and wearable electronics. The thickness and uniformity of these layers are crucial factors that influence surface planarization, mechanical stress relief, and the enhancement of optical performance. Therefore, accurate measurement of their thickness distribution is essential. In this study, the two-dimensional thickness distributions of spin-coated and inkjet-printed organic microlayers on glass substrates, which are used in optically transparent resin for displays and thin film encapsulation for flexible OLEDs, were quantitatively and qualitatively measured using UV light extinction imaging method. Quantitatively, the organic materials tested absorbed 40 to 50% of light with a wavelength of 300 nm through a layer with a thickness of 3 to 4 μm. Consequently, a measurement error of less than a few nanometers could be achieved through image overlay and pixel binning. Qualitatively, this non-destructive, non-contact two-dimensional measurement method enables immediate and intuitive analysis of the thickness distribution or surface waviness of the coated layer.

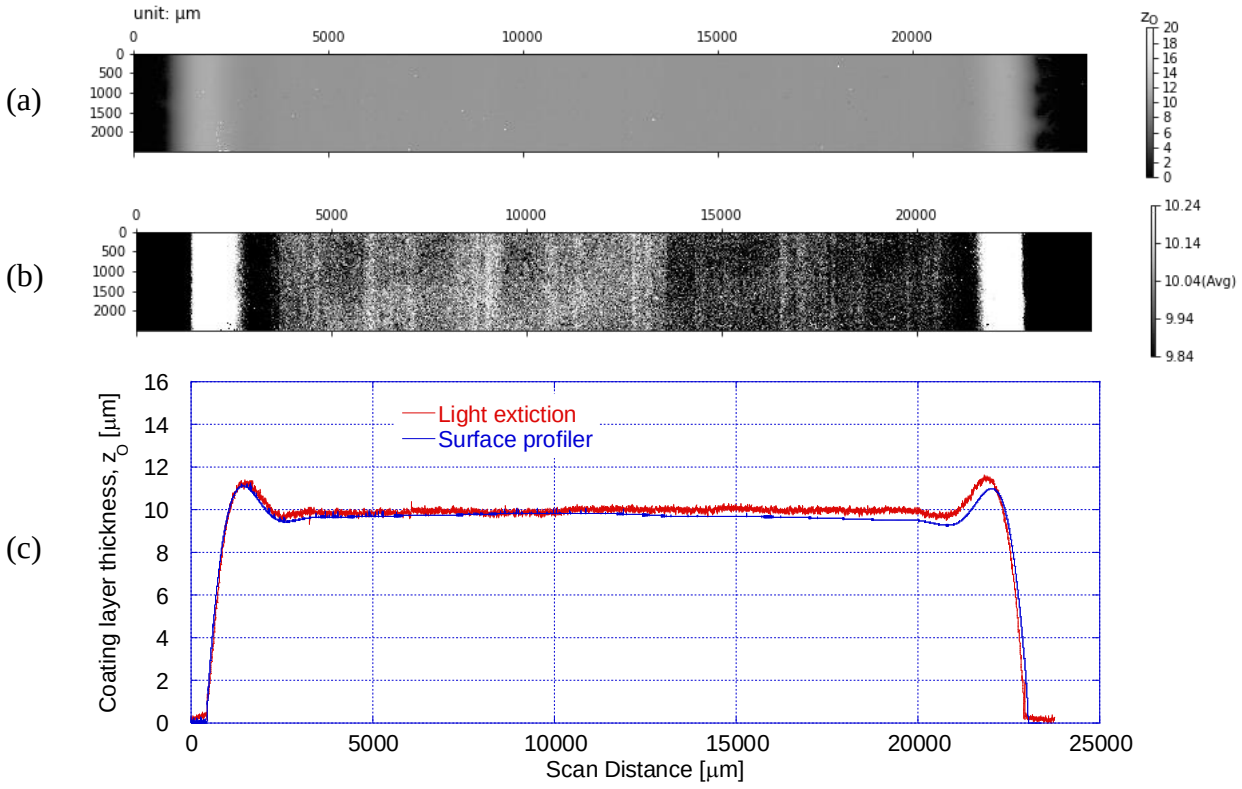

Figure 1. Edge-to-edge thickness distribution of inkjet-printed organic layer measured by the light extinction method: (a) 2D distribution in full scale; (b) 2D distribution in 100 nm scale; (c) cross-sectional profile compared with surface profile measured by alpha-step.