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Study on dispersibility of thermally stable carbon black particles in ink using asymmetric flow field-flow fractionation (AsFIFFF)

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Abstract

Carbon black (CB) has excellent chemical and physical properties including strong chemical strength and electrical conductivity. CB is widely used in various industries such as semiconductor, tire, rubber, ink, paint, toner and resin. When used in ink, as the CB particle size and the size distribution become smaller and narrower, respectively, they tend to be better dispersed, and the glossiness and stability of the ink increases.

In the present study, asymmetrical flow field-flow fractionation (AsFIFFF) was employed to analyze the size distribution of CB particles used in ink. CB suspensions were prepared by dispersing CB powder in aqueous media containing copolymeric dispersing agents of hydrophobic (styrene) and hydrophilic (acrylic or maleic acid) monomers. Experimental parameters of AsFIFFF were optimized for analysis of the CB particles.

Although the mean sizes obtained by AsFIFFF and dynamic light scattering (DLS) were in good agreements for those with narrow size distributions, DLS failed to distinguish among the CB suspensions having broad size distributions, whereas AsFIFFF differentiated them easily. Results indicated that the CB particles were dispersed better with copolymeric dispersing agents having an aromatic polymer with OH functionality than those with COOH functionality. It was also observed that, as the mean size of the CB particles decreases and the size distribution becomes narrower, the ink become thermally more stable.

KEYWORDS: Carbon black (CB) suspension; surface treatment; Asymmetric flow field-flow fractionation (AsFIFFF); particle size distribution; Thermal stability

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