Application of digital holographic microscopy and microfluidic chips to the measurement of particle size distribution of fly ash after a wet electrostatic precipitator

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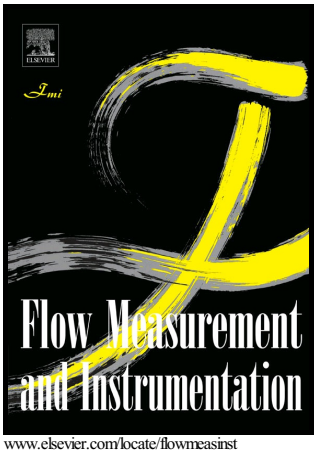

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Abstract: In-line digital holographic microscopy is used to obtain a particle size distribution of fly ash after wet electrostatic precipitators. A polydimethylsiloxane microfluidic chip with a cross section of 50×200μm^2 is fabricated to offer a suitable experimental environment and constant background. Equivalent Charge Coupled Device pixels are calibrated to be 0.1016μm, leading a 35.4-times magnification. A sample containing standard particles of 2 μm is first analyzed to confirm the validity and stability of the digital holographic microscopy under flowing condition. The average diameter is reconstructed to be 2.03μm, leading to a relative standard deviation of 1.5%. Then samples acquired after the wet electrostatic precipitator of a coal power plant is analyzed. Large amounts of holographic pictures are taken and reconstructed to obtain a particle size distribution from 0.5μm to 3.52μm. Finally the