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NUMERICAL ANALYSIS FOR PARTICLE CAPTURE CHARACTERISTIC AND CURVE STEEPNESS OF IMPACTION SIZER

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Numerical analysis for particle capture characteristic and curve steepness is important for testing an impaction sizer. In this study, the tested particles and the aerodynamic particle sizer were used to measure the particle capture efficiency of the impaction sizer. Numerical methods were also used to obtain the particle capture characteristic and curve steepness of the impaction sizer. The flow field in the impaction sizer was simulated by solving the Navier-Stokes equations in the cylindrical coordinate. The governing equation was discretized by means of the finite volume method. After obtaining the flow field, the particle equations of motion were solved numerically to obtained particle capture efficiency of the impaction sizer. Liquid particles were generated by using an ultrasonic atomizing nozzle. An aerodynamic particle sizer was used to measure the aerosol number concentrations at the inlet and outlet of the impaction sizer to test the particle capture efficiency. Results show that the particle capture efficiencies of impaction sizer with porous substrate decrease as the square root of Stokes number decreased. In addition, the cut-size of the impaction sizer with porous substrate for the jet diameter of 0.85 cm is found to be smaller than those with porous substrate of 3mm depth for the jet diameter of 1.0 cm at same flow rate. This study performed the numerical calculations for the particle capture efficiencies of the impaction sizer with the porous substrate. The numerical results of the particle capture efficiencies of the impaction sizer were close to those of the experimental data.