Supporting Information

Reduction of submicron-sized aerosols by aerodynamically-assisted electrical attraction with micron-sized aerosols

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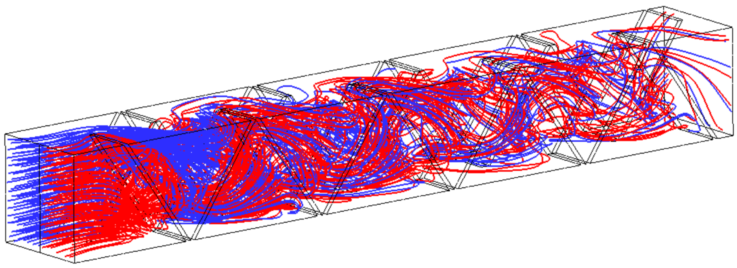
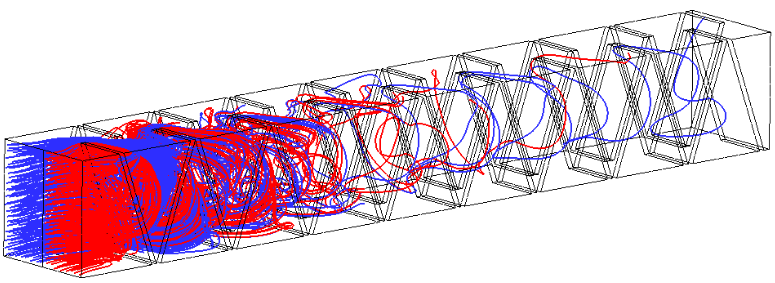
1. Comparison between vortex generator shapes (numerical calculation)

The steady-state Reynolds-averaged Navier–Stokes (RANS) equations were solved using ANSYS FLUENT to obtain the flow field and pressure drop inside the agglomerator. The agglomerator comprised two parallel metal plates placed 4 cm apart and a vortex generator (made of acrylic, cross-sectional area: 4 × 4 cm^2). The vortex generator comprised thin plates (width: 4.8 × 2 cm^2; thickness: 1.6 mm) arranged repeatedly in an isosceles triangle shape. Numerical calculations were performed for two triangle shapes of 55° (see Fig. S1-a) and 70° (Fig. S1-b). Fig. S1-a and S1-b show that the flow from the inlet (left side) to the outlet (right side) was gradually mixed in the agglomerator (inlet velocity = 1 m/s). The red and blue lines in the streamline were set to visually illustrate the mixing of the flow.



(a)



(b)

Figure S1. (a) Streamlines for 55° (b) streamlines for 70°

In Fig. S2, the pressure drop of each agglomerator is shown as a function of velocity. The orange and blue bars represent the pressure drops of agglomerators with angles of 55° and 70°, respectively. At a velocity of 0.1 m/s, the pressure drops were 1.9 Pa (55°) and 14.3 Pa (70°). At 0.5 m/s, an increase in pressure drop was observed, reaching 49 Pa (55°) and 377 Pa (70°). When the velocity was 1 m/s, the pressure drop increased significantly to 206 Pa (55°) and 1501 Pa (70°).

Therefore, the shape with a 55° vortex generator allowed for more efficient outflow.

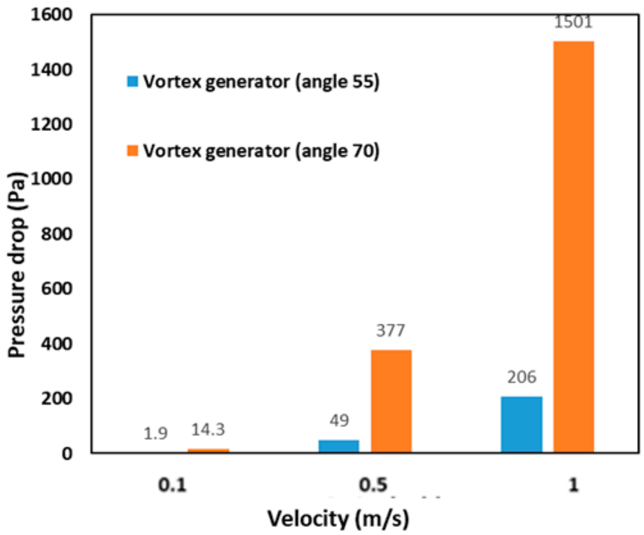


Figure S2.

2. Trajectories of particles and the corresponding wall losses.

To study wall losses, the Discrete Phase Model (DPM) was used to track particle trajectories and calculate corresponding wall losses. A total of 200 particles were introduced, of which 3 particles were captured by the wall, resulting in a wall loss of 1.5%.

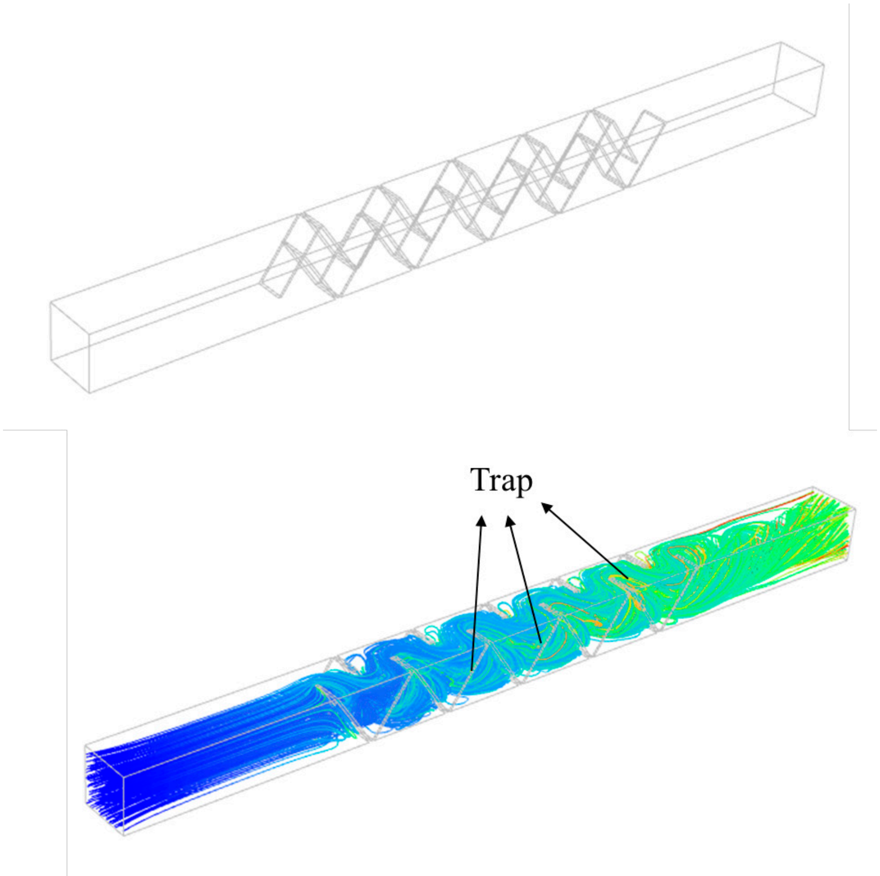


Fig. S3