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Non-spherical aerosol transport under oscillatory shear flows at low-Reynolds numbers LIHI SHACHAR BERMAN, YANN DELORME, PHILIPP HOFEMEIER, STEVEN FRANKEL, JOSUE SZNITMAN, None — Most airborne particles are intrinsically non-spherical. In particular, non-spherical particles with high aspect ratios, such as fibers, are acknowledged to be more hazardous than their spherical counterparts due to their ability to penetrate into deeper lung regions, causing serious pulmonary diseases. Not only do particle properties such as size, shape, and density have a major impact on particle transport, for non-spherical aerosols, their orientations also greatly influence particle trajectories due to modified lift and drag characteristics. Until present, however, most of our understanding of the dynamics of inhaled particles in the deep airways of the lungs has been limited to spherical particles only. In the present work, we seek to quantify through numerical simulations the transport of non-spherical airborne particles and their deposition under oscillatory shear flows at low Reynolds numbers, characteristic of acinar airways. Here, the Euler–Lagrangian model is used to solve the translational movement of a fiber, whereas the Eulerian rotational equations are introduced and solved to predict detailed unsteady fiber orientations. Overall, our efforts provide new insight into realistic dynamics of inhaled non-spherical aerosols under characteristic breathing motions.

Lihi Shachar Berman
None

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