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Modeling Particle Motion Through Electret Filter Media DANA ROTTACH, National Personal Protective Technology Laboratory/Centers for Disease Control and Prevention — Filtering facepiece respirators (FFR) stockpiled for use during public health emergencies such as an infectious disease outbreak or pandemic can be subjected to conditions which could lead to performance degradation. The traditional picture of small particle capture by fibrous filter media qualitatively separates the effect of inertial impaction, interception from the streamline, diffusion, settling, and electrostatic attraction. Most of these mechanisms depend upon stable conformational properties. However, common FFR rely on electrets to achieve their high performance, and over time heat and humidity can cause degradation. A single-particle Newtonian dynamics simulation including a stochastic diffusive term, a hydrodynamic Stokes term, and a term representing an electret-induced dipole attraction has been developed to allow simultaneous consideration of the traditionally separated filtration modes. The electret term is allowed to decay between successive runs to mimic aging of the media. The initial simulations simulate particle collection by a single fiber using the 2D Kuwabara expression for fluid flow around a fiber. Subsequent simulations will use more realistic 3D fiber configurations with the fluid flows precalculated using traditional computational fluid dynamics.

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