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Cylindrical Spacer Shape Optimization for Enhanced Inhalation Therapy

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Abstract : Asthma and Chronic obstructive pulmonary disease (COPD) are common lung diseases that have a significant global impact. Pressurized metered dose inhalers (pMDIs) are widely used for treatment, but they can have limitations such as high medication release speed resulting in drug deposition in the mouth or oral cavity and difficulty achieving proper synchronization with inhalation by users. Spacers are add-on devices that improve the efficiency of pMDIs by reducing the release speed and providing space for aerosol particle breakup to have finer and medically effective medication. The aim of this study is to optimize the size and cylindrical shape of spacers to enhance their drug delivery performance. The study was based on fluid dynamics theory and employed Ansys software for simulation and optimization. Results showed that optimization of the spacer's geometry greatly influenced its performance and improved drug delivery. This study provides a foundation for future research on enhancing the efficiency of inhalation therapy for lung diseases.

Keywords : asthma, COPD, pressurized metered dose inhalers, spacers, CFD, shape optimization
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