Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Role of Topological Heterogeneity on the Fate of Inhaled Aerosols in the Pulmonary Acinus PHILIPP HOFEMEIER, Department of Biomedical Engineering, Technion - Israel Institute of Technology, KENICHIRO KOSHIYAMA, SHIGEO WADA, Graduate School of Engineering Science, Osaka University, JOSUE SZNITMAN, Department of Biomedical Engineering, Technion - Israel Institute of Technology — Particle transport, and ultimately deposition outcomes, in the acinar region of the lungs are intrinsically coupled with local the shape and morphology of the airways and alveolar cavities (Hofemeier and Sznitman, 2015). Thus, it is paramount to capture the complexity and heterogeneity of the acinar environment in order to predict realistic aerosol dynamics. Recently, Koshiyama and Wada (2015) introduced an algorithm to generate acinar models with space-filling heterogeneous alveolar structures to mimic realistic in vivo environments. Their model is able to reproduce the characteristic polyhedral shape and size of alveolar cavities as well as the length and branching angles of the connecting airways. Here, we utilize for the first time such acinar models as the basis for numerical simulations of respiratory acinar flows and particle transport. By generating and modeling various heterogeneous multi-generation acinar models, we aim to shed light on the role of spatial acinar heterogeneity on particle deposition fate, as a function of inhaled particle size and breathing maneuvers. The present studies are a first step towards predicting realistic acinar deposition patterns indicative for whole lung statistics as well as inter-acinar differences.

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Date submitted: 01 Aug 2015 Electronic form version 1.4