Why Detoxing All Combustion Engines? A Computer Model Approach to Regional Lung Deposition

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Particle Properties

Breathing Pattern

Inhalation: 2.5 s

Exhalation: 2.5 s

minute: 12

 $C_p(d_p \varrho_p) \Delta log d_p \, DF(d_p, \varrho_p, i) \, t_e \, Q$

Tidal volume: 750 ml

Breathing via: mouth

Deposition

in Lung

Regions

Breaths per

Shape: spherical (droplets)

Lung

Model

Regions

Hygroscopicity: none

Introduction

Regional lung deposition of inhaled substances can hardly be determined experimentally. Computer software is available to reproduce existing measured deposition data and to model lung deposition customized to a variety of parameters. Based on our hygroscopic particle lung deposition (HPLDB) model, deposition scenarios are calculated here by convolution of the characteristics of an emission aerosol and the properties of the respiratory tract.



Deposited mass from constant concentration



Convolution:

D

Conclusion

i) Modifying the emission characteristics results in modified regional lung burden and - as a consequence - in modified health effects.

Therefore, we should aim for a full detoxication of all emissions.

ii) The modeled regional dose D may be a better parameter for correlation with health effects than ambient number or mass concentration alone

HPLDB-Model Access: https://www.hmgu.de/cma/forschung/

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HICE Aerosols and Health

Imholtz Virtual Institute of Complex olecular Systems in Environmental Health

Modeling Measured Data





HelmholtzZentrum münchen eit und Umwelt

10

100

d_p [nm]

1 0 0 0

10 000

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