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Deposition of Multi-Walled Carbon Nanotube (MWCNT) Aerosols in Human Nasal, Oral, and Lung Airways. WEI-CHUNG SU, Yung-Sung Cheng, Teh-Hsun Chen, *University of Texas Health Science Center at Houston*

Multi-Walled Carbon Nanotubes (MWCNTs) has been widely applied as additives in many commercial products today due to their unique physical properties. MWCNT materials might become airborne during manufacturing and application processes, and they could be inhaled by related workers and researchers causing potential lung problems. Therefore, studying the deposition of MWCNT aerosols in human respiratory tract is especially important from the viewpoint of occupational health to estimate associated MWCNT lung dosimetry. This study tried to use a special experimental approach to obtain original data for MWCNTs human airway deposition. In this study, the test MWCNT material was aerosolized by an unique generation system developed by NIOSH. A differential mobility analyzer (DMA) was employed to size classify the generated MWCNT aerosols into three designated classification diameters (nominal diameters: 100, 200, and 300 nm). The human airway deposition experiments were conducted by delivering the size classified MWCNT aerosols into well-defined human nasal, oral, and lung airway replicas. The deposition fraction and the deposition efficiency of the MWCNT aerosols in the human airway were determined by measuring the differential concentration of MWCNT aerosols between the inlet and outlet(s) of the airway replica using a sequential mobility particle sizer (SMPS). The deposition data obtained from this study showed that MWCNT deposition fractions found in most airway sections used in this study were generally less than 7%. This result implies that, within the aerosol size range studied, most of the MWCNT aerosols inhaled into the human airways can easily pass through the upper airways and transit down to the lower airways where adverse health effects might be induced. The experimental method used in this study is believed also could be applied on other nanomaterial aerosols to investigate the human airway deposition, which would greatly facilitate the health risk assessment for exposure to various nanomaterials in laboratories or workplaces.

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Oxidative Potential and Chemical Characteristics of Water-soluble Particles Produced by Burning Rice Straw and Pine Wood. LUCILLE JOANNA BORLAZA, Bhuwan Paudel, Arom Seo, KwangYul Lee, HungSoo Joo, Shila Maskey, Kihong Park, *Gwangju Institute of Science and Technology, South Korea*

Fine particulate matter (PM_{2.5}) produced from biomass burning emissions has been increasingly associated with respiratory diseases (Laumbach et al., 2012; Torres-Duque et al., 2008; Arbex et al., 2007). Exposure to PM_{2.5} has been known to cause adverse health effects through several mechanisms of action including oxidative stress. In lieu of common assessment of PM_{2.5} health effects, this study investigated the capacity of biomass burning – related PM_{2.5} to cause oxidative stress through the formation of reactive oxygen species (ROS). Laboratory – generated PM_{2.5} from burning of rice straw and pine wood was sampled in a controlled volume chamber and collected using URG cyclones on teflon filters at different burning phases (approximately 1- 20 mins, 21- 40 mins, and 41- 60 mins after burning of sample). Particle size distribution and mass concentration was monitored by coupling an optical particle counter and a scanning mobility particle sizer. Two chemical assays were used to characterize OP of water-soluble PM_{2.5}: dithiothreitol (DTT) and electron spin resonance (ESR) assay. OP-DTT was carried out through assessment of the capability of redox active compounds in PM_{2.5} to transfer electrons from DTT to oxygen thereby generating superoxides. The consumption of DTT over specific time intervals (5, 15, 25, 35 and 45 mins) was interpreted as a measure of the capability of ambient PM_{2.5} to produce ROS. On the other hand, OP-ESR was performed using ESR with a spin trap (5,5 – dimethylpyrroline – N – oxide or DMPO) which measures the capability of PM_{2.5} to generate hydroxyl radicals (•OH) through Fenton type reactions with the presence of hydrogen peroxide. Dithiothreitol (DTT) assay was used to characterize OP of water – soluble PM_{2.5}. Varying physical and chemical properties; and OP results with biomass types and combustion conditions will be presented.