ABSTRACT

Cigarette smoking is credited for decreasing the world population annually by about 1%. This paper therefore explores the carcinogenic and mutagenic residue (tar), and particulate matter from the thermal degradation of tobacco cigarettes coded, SPM and ES1, at a residence time of 2.0 s at 1 atm. This study was carried out in the temperature range 200–600 °C with nitrogen as the pyrolysis gas. Field emission gun scanning electron microscope was used to image the nature of particulate emissions from tobacco smoke. It was shown that tobacco smoke particulates are ultrafine; ~22 and 28 nm for SPM and ES1 cigarettes respectively. Particle deposition fraction in the human lung and pulmonary lobes was simulated using the Multipath Particle Deposition (MPPD) model. The ultrafine particulates if inhaled are grave precursors for various respiratory health ailments. Maximum tar yield was produced at ~400 °C. Thus, designing cigarettes that may be smoked at temperatures lower than 400 °C may be beneficial to the tobacco smoking community. From MPPD model runs, it was found that the pulmonary tissue retained the highest fraction (0.448) of particles of 22 nm geometric diameter in comparison to 0.418 fraction of the slightly larger particles of 28 nm geometric diameter from ES1 cigarette. This implies that the respiratory system has a poor clearance of particles of smaller geometric diameter. Thus, extremely ultrafine particulates are of grave concern to cigarette smokers.