

## **ABSTRACT:**

The events occurring during tobacco burning are complex. Consequently, more than 7000 compounds are generated during cigarette smoking. Particulate inhalants including tobacco thermal emissions carrying with them aggressive free radicals are a serious health concern to tobacco researchers and public health authorities. This paper investigates tobacco charcoal as a source of thermal particulates and environmentally persistent free radicals considered deleterious to cigarette smokers and the natural environment. From a clinical perspective, free radicals and particulate emissions are capable of initiating carcinogens, mutagens, and ageing ailments. Standard procedures representative of cigarette smoking (ISO 3402:1999) were observed in this study. The particulate nature and surface morphology of tobacco thermal char was examined using a Field electron gun scanning electron microscope (FEG SEM) while Electron paramagnetic resonance (EPR) was used to explore the presence of free radicals on tobacco charcoal. On the other hand, Fourier transform infrared (FTIR) spectroscopy was used to investigate the surface functionality of tobacco char. At a pyrolysis temperature of 600 oC, the mean size of small particulates from tobacco burning measured using image J was found to be  $16.66 \pm 1.88$  nm and that of the large particulates was found to be  $26.90 \pm 2.52$  nm. Electron paramagnetic resonance (EPR) gave a g-value of 2.0029 typical of carbon-centred radicals such as the benzyl radical. A broad peak at 3460  $\text{cm}^{-1}$  was due to  $\text{-O-H}$  absorption while the peak at 1630  $\text{cm}^{-1}$  was attributed to  $\text{-C=C}$  stretching. This study has demonstrated that particulate size of tobacco emissions are ultrafine ( $\text{PM}_{0.1}$ ) and can possibly be deposited in the tracheobronchial and alveoli regions of the lungs thus precipitating serious harm to cigarette smokers as well as second hand smokers. Sensitization on the dangers of cigarette smoking will reduce the socio-economic burden associated with clinical problems arising from tobacco use.