

ABSTRACT

This contribution investigates the formation of selected oxygenated molecular compounds with smoking temperatures, particulates and free radicals from the burning of tobacco selected from two cigarettes (SM1 and ES1), in a poor oxygen environment - an oxidative atmosphere (5% oxygen in N₂), in the temperature region 200–700 °C at 2 s contact time. Molecular carbonyls were determined using a Gas chromatography (GC) hyphenated to a mass selective detector (MSD). Fourier transform infrared (FTIR) spectroscopy afforded the determination of functional groups adsorbed on tobacco particulates. Free radicals in tobacco smoke particulates were investigated using an electron paramagnetic resonance spectrometer (EPR) whereas particulate size of tobacco smoke was estimated using image J. Aztec (UK) software coupled to an Oxford detector (UK) facilitated elemental analysis of tobacco char. At ~ 400 °C, 2-methylcyclopentenone gave a maximum yield of 7.95 μ g while 2-methyl-2-propanol had a maximum yield of 14.75 μ g. The absorption band at 1740 cm⁻¹ confirms the presence of carbonyl groups (–C=O) adsorbed on tobacco smoke particulates. Tobacco particulates generated at 600 °C showed an isotropic *g*-value of 2.0028 and a particle size distribution between 18 and 30 nm. It was noted that SM1 cigarette had very high radical, oxygen and nitrogen content and therefore considerably more toxic than ES1 cigarette. Tobacco char was largely carbon (~66–69%) – Energy dispersive X-ray (EDX) data hence the major reason carbon based radicals dominated the oxygen centered radicals at elevated temperatures. Generally, tobacco free radicals are very reactive intermediates and therefore precursors for detrimental ailments associated with cigarette smoking. These findings support the fact that research based policy framework is essential in minimizing the burden associated with tobacco abuse.

Keywords

Carbonyls

Elemental analysis

Free radicals

Poor oxygen environment