

## ABSTRACT

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Pyrolysis of biodiesel at high temperatures may result in the formation of transient and stable free radicals immobilized on particulate emissions. Consequently, free radicals adsorbed on particulates are believed to be precursors for health-related illnesses such as cancer, cardiac arrest, and oxidative stress. This study explores the nature of free radicals and particulate emissions generated when *Croton megalocarpus* biodiesel is pyrolyzed at 600 °C in an inert environment of flowing nitrogen at a residence time of 0.5 s at 1 atm. The surface morphology of thermal emissions were imaged using a field emission gun scanning electron microscope (FEG SEM) while the radical characteristics were investigated using an electron paramagnetic resonance spectrometer (EPR). A g-value of 2.0024 associated with a narrow  $\Delta H_{p-p}$  of 3.65 G was determined. The decay rate constant for the radicals was low ( $1.86 \times 10^{-8} s^{-1}$ ) while the half-life was long  $\approx 431$  days. The observed EPR characterization of *Croton megalocarpus* thermal particulates revealed the existence of free radicals typical of those found in coal. The low g-value and low decay rate constant suggests that the free radicals in particulates are possibly carbon-centered. The mechanistic channel for the formation of croton char from model biodiesel component (9-dodecenoic acid, methyl ester) has been proposed in this study.