含水率对福建森林草本植物燃烧碳排放的影响

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摘要:为探究草本可燃物在不同含水率下的碳排放特性,本文采用自主设计的生物质燃烧和分析系统模拟不同含水率下福建省林下常见草本(福建观音座莲、芒萁、五节芒、莠竹)的燃烧过程,实时监测并计算烟气中含碳气体(CO_2、CO、C_xH_y)和$PM_{2.5}$中碳质组分(TC、OC、EC)的排放因子,分析 OC 和 EC 之间的比值及相关性,比较不同碳排放物质的碳转化效率差异,揭示森林地面可燃物含水率变化对燃烧碳排放的影响.结果表明:①草本含水率对碳排放物质排放因子具有显著影响,随着含水率的增加,CO_2的排放受到抑制,促进了 CO、C_xH_y、$PM_{2.5}$碳质组分的排放;②草本含水率对 OC 与 EC 之间的比值具有较显著的影响,随草本含水率的增加会造成 $K_{OC/EC}$增加,但不会改变 OC 和 EC 之间的强相关性;③草本含水率的变化会影响碳排放物质与碳元素的质量比和碳转化率,本研究所有碳排放物质与碳元素的质量比同这些物质的排放因子变化趋势相似,随着草本含水率的增加,η_{CO2}降低,η_{CO}升高,η_{Other}先略微升高后大幅降低.

关键词:林火;含水率;地面可燃物;草本;碳排放

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Effect of water content on carbon emissions from combustion of forest herbaceous plants of Fujian.

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Abstract:In order to investigate the carbon emission characteristics of herbaceous combustible materials under different water contents, this paper adopts the self-designed biomass combustion and analysis system to simulate the combustion process of widely distributed forest herbs in Fujian Province (*Angiopteris fokiensis*, *Dicranopteris pedata*, *Miscanthus floridulus*, and *Microstegium vimineum*) under different water contents, and monitor and calculate the carbon gas (CO_2, CO, C_xH_y) and carbonaceous components (TC, OC, EC) in the flue gas in real time. We analyzed the ratio and correlation between OC and EC, compared the carbon conversion efficiency of different carbon substances, and revealed the effect of water content on the carbon emission of surface combustible material of forest. The results showed that (1) herbaceous water content has a significant effect on the emission factors of carbon substances. The emission of CO_2 is inhibited with the increase of water content, conversely promoted the emission of CO, C_xH_y and $PM_{2.5}$ carbonaceous components; (2) herbaceous water content has a relatively significant effect on the ratio between OC and EC, and the increase of water content will cause the increase of herbaceous $K_{OC/EC}$, but does not change the strong correlation between OC and EC; (3) Changes in water content affect the mass ratio of carbon substances to carbon elements and the carbon conversion rate. The mass ratio of all carbon substances to carbon elements is similar to the trend of the emission factors of these substances. With the increase of herbaceous water content, η_{CO2} decreases, η_{CO} increases, and η_{Other} increases

slightly and then decreases significantly.

Key words:Forest fire;Moisture content;Ground fuel;Herb;Carbon emission