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Storage Stability of Aviation Bio-fuel Derived from Waste Wood Pyrolysis Oil: Chemical and Physical Property Evaluation

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Extended Abstract

The aviation industry is actively striving to reduce carbon emissions in line with the International Civil Aviation Organization's (ICAO) target of achieving net-zero carbon emissions by 2050 [1]. Bio-jet fuel is anticipated to play a crucial role in achieving this goal, and its demand is projected to increase rapidly. However, the majority of bio-jet fuel is currently produced from used cooking oil (USO), such as tallow [2]. The current amount of USO is insufficient to meet the full demand for bio-jet fuel, thus research into securing a range of raw materials is a significant trend [3]. Bio-oil obtained from the fast pyrolysis of lignin-based biomass, such as waste wood, is considered a promising alternative for producing bio-jet fuel through processes like hydrodeoxygenation [4]. In this study, the changes in physical properties and composition of bio-jet fuel produced by blending wood-derived pyrolysis bio-oil with conventional petroleum-based jet fuel at various ratios (0%, 10%, 50%, 100%) were investigated over a 16-week storage period [5]. The results showed that the total acid number increased sharply after 12 weeks in all blended fuels, exceeding 0.1 mg KOH/g after 16 weeks. Additionally, kinematic viscosity steadily increased over the 16 weeks, and the oxidative stability of the 100% bio-jet fuel decreased by approximately 20% at the 16-week mark. In higher blends of bio-jet fuel, the final boiling point increased by up to 20%, and the average molecular weight also tended to increase. Bio-jet fuel has a high olefin content, which can further increase during storage, potentially leading to a decline in combustion characteristics. In conclusion, this study suggests that using up to 10% of bio-jet fuel in aircraft may be safe considering storage stability. However, further research is required to confirm these findings.

Keywords: Aviation Bio-fuel, Storage Stability, Waste wood, Pyrolysis bio-oil, Storage stability

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