

Turning Dairy Sludge into Value: Temperature and Pyrolysis Route as Key Drivers of Gas Yield and Composition

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Valorization of dairy sludge from the Asturian dairy industry



Objetives

- This study aims to evaluate the energy valorization potential of dairy industry sludge through pyrolysis processes (conventional pyrolysis (CP) v.s. flash pyrolysis (FP)) within a temperature range of 450 to 750 °C.
- In particular, the work focuses on optimizing the yield and quality of the gaseous fraction produced, contributing to the development of sustainable waste management strategies and reducing dependence on non-renewable energy sources.

Results & Discussion

CONVENTIONAL PYROLYSIS (PC)
25 °C /min, 500°C - 750 °C

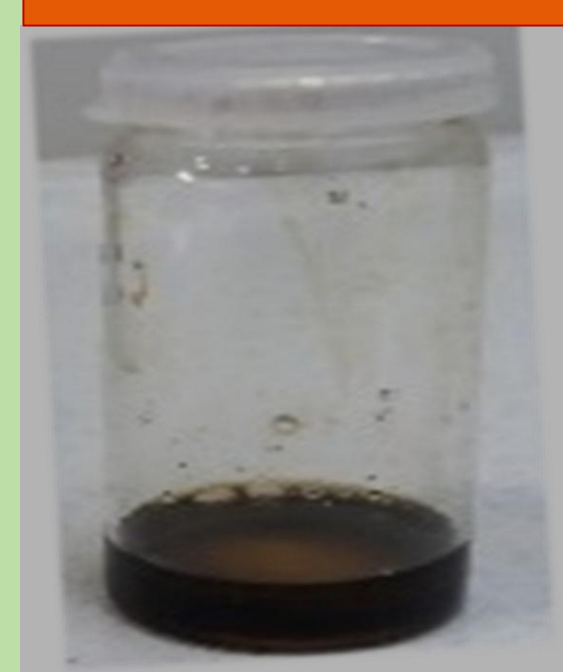


FLASH PYROLYSIS (PF)
600 °C - 750 °C

BIO-CHAR



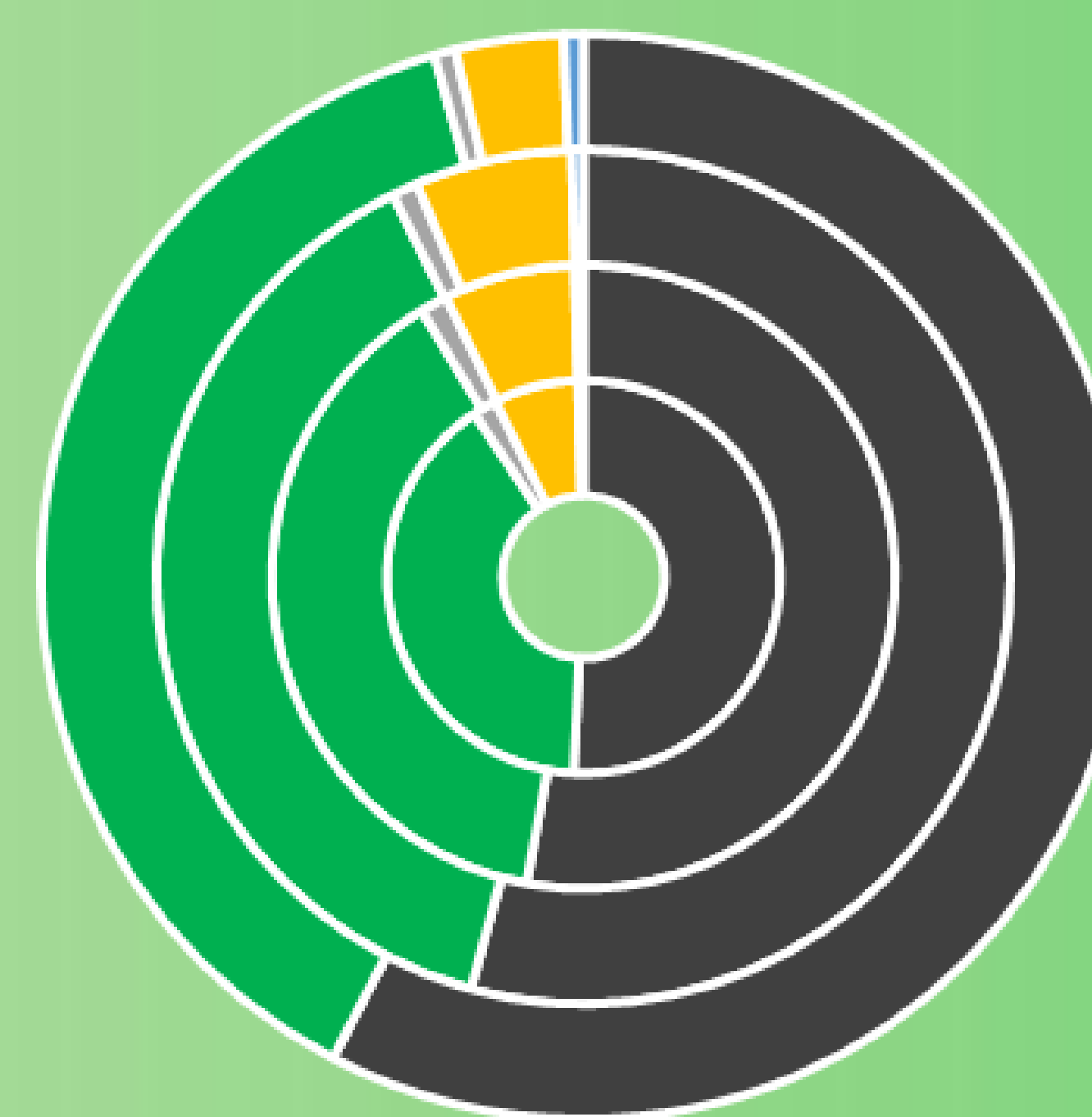
BIO-OIL



GAS

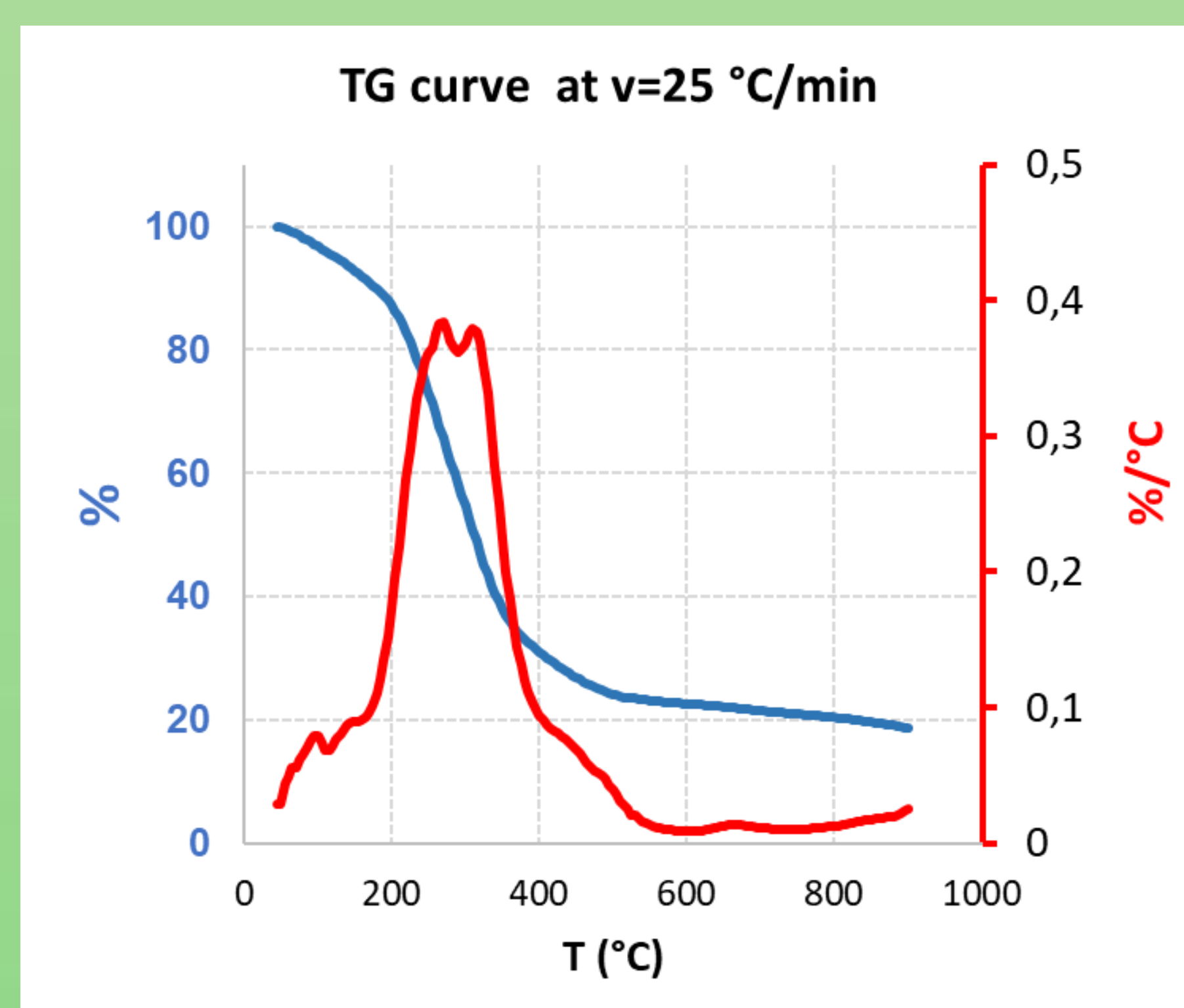


Ultimate analysis of conventional biochars

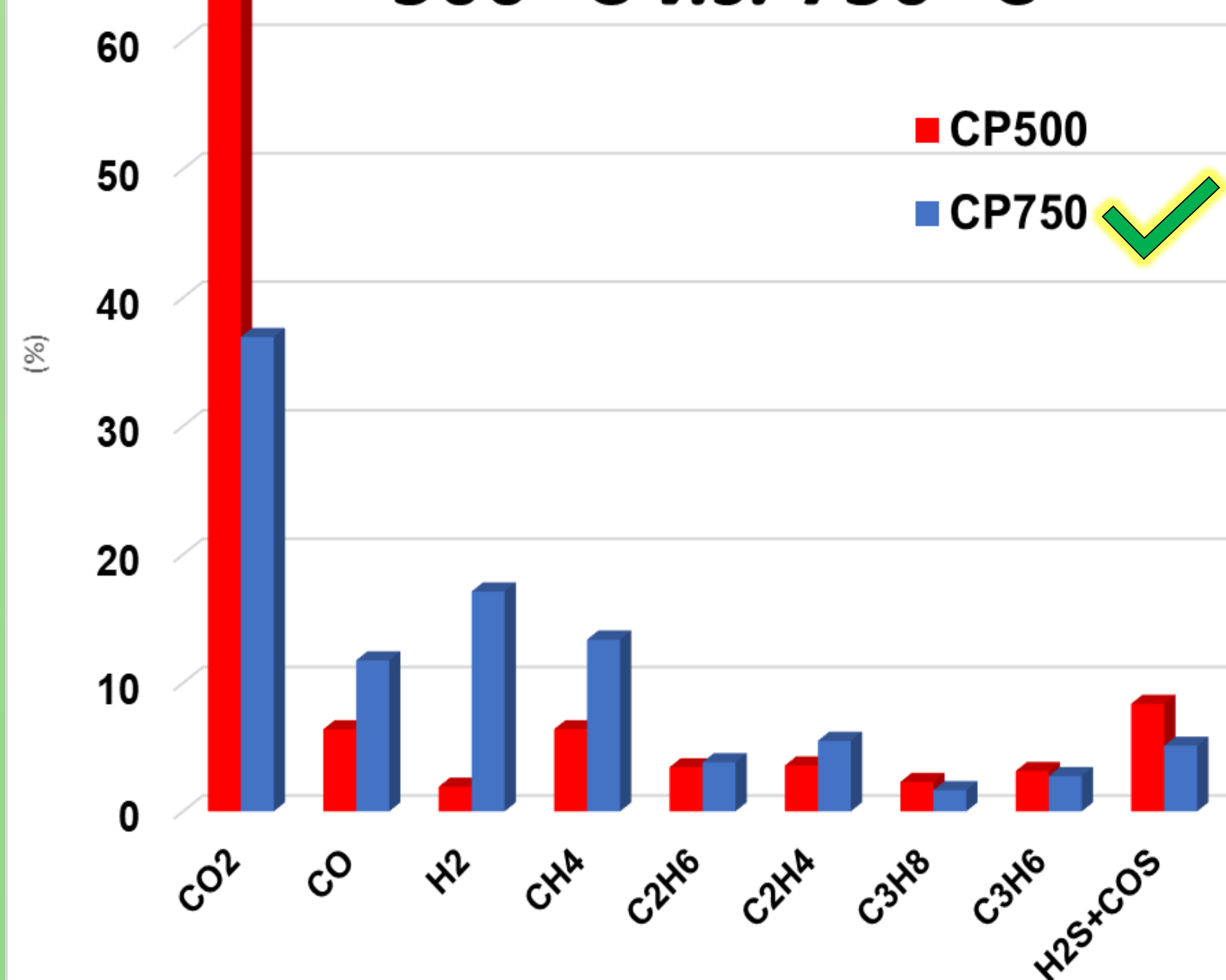


■ Ash ■ C ■ H ■ N ■ S

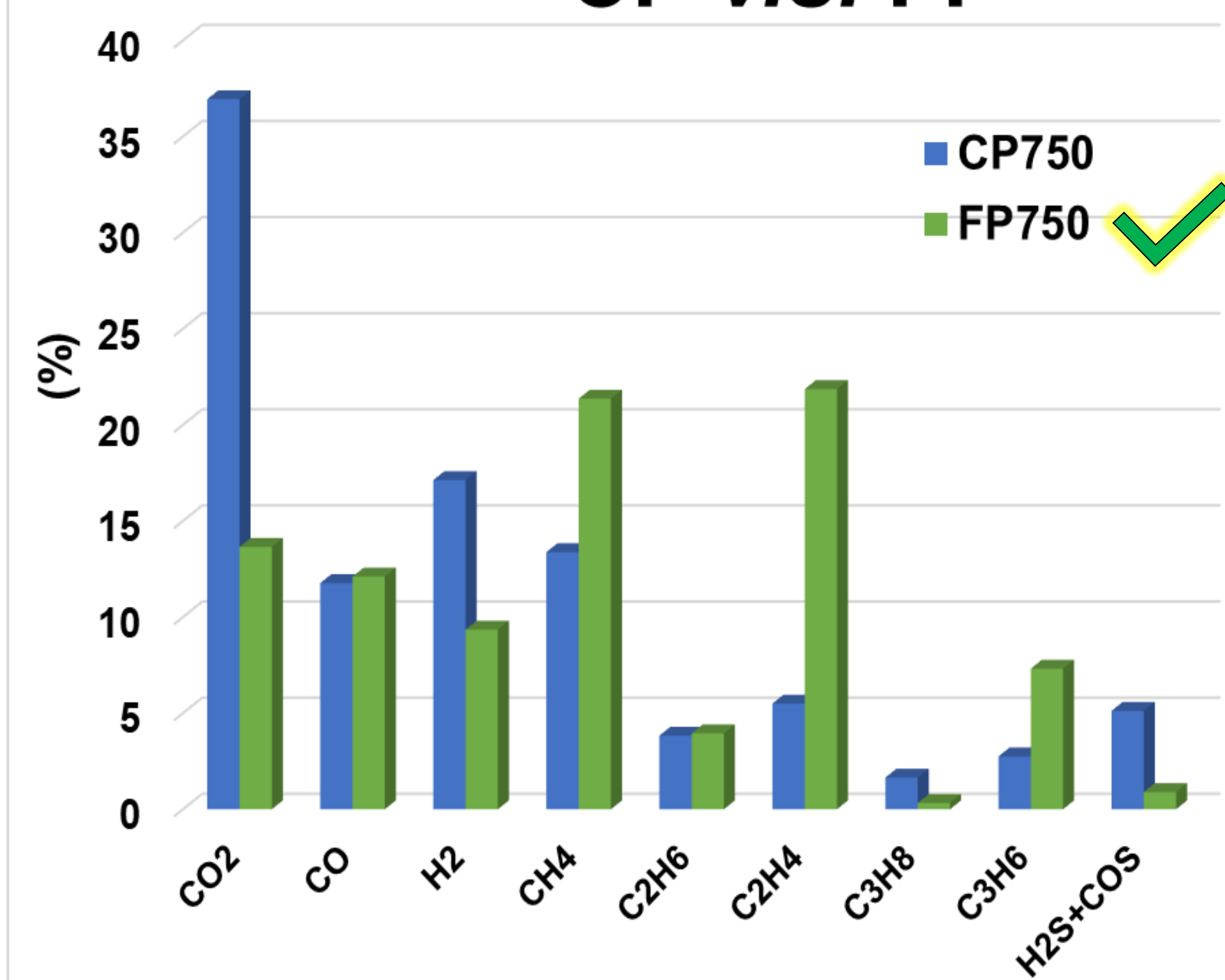
Thermogravimetric analysis of dairy sludge



500 °C v.s. 750 °C



CP v.s. FP



Conclusions

- Dairy sludge is a promising feedstock for pyrolysis, enabling the transformation of waste into value-added products while contributing to sustainable energy recovery systems.
- Pyrolysis fractions yield and composition are strongly influenced by both temperature and pyrolysis process type.
- Flash pyrolysis (FP) outperforms conventional pyrolysis (CP), achieving higher gas yields and producing a gas richer in valuable compounds, especially ethylene.
- Overall, FP gas shows high energy potential and can be used both as a fuel and as a feedstock for chemical applications.

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