

Unlocking the Full Potential of Macroalgae Sludges: Thermochemical Pathways to Biochar, Bio-Oil and Gas

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OBJECTIVE



Macroalgae "*Gelidium corneum*"

MACROALGAE SLUDGES (RK2)

To comprehensively evaluate macroalgae sludge as a sustainable feedstock for thermochemical conversion via pyrolysis by

- ❖ Characterizing its physicochemical properties,
- ❖ Investigating the influence of operating conditions, including temperature and heating rate, on product distribution (biochar, bio-oil, and gas)
- ❖ Assessing the composition and quality of the resulting products for their potential application in energy recovery, environmental remediation, and resource valorization, with the aim of supporting the development of integrated waste-to-energy systems.

RESULTS & DISCUSSION

CONVENTIONAL PYROLYSIS (CP) And FLASH PYROLYSIS (FP)



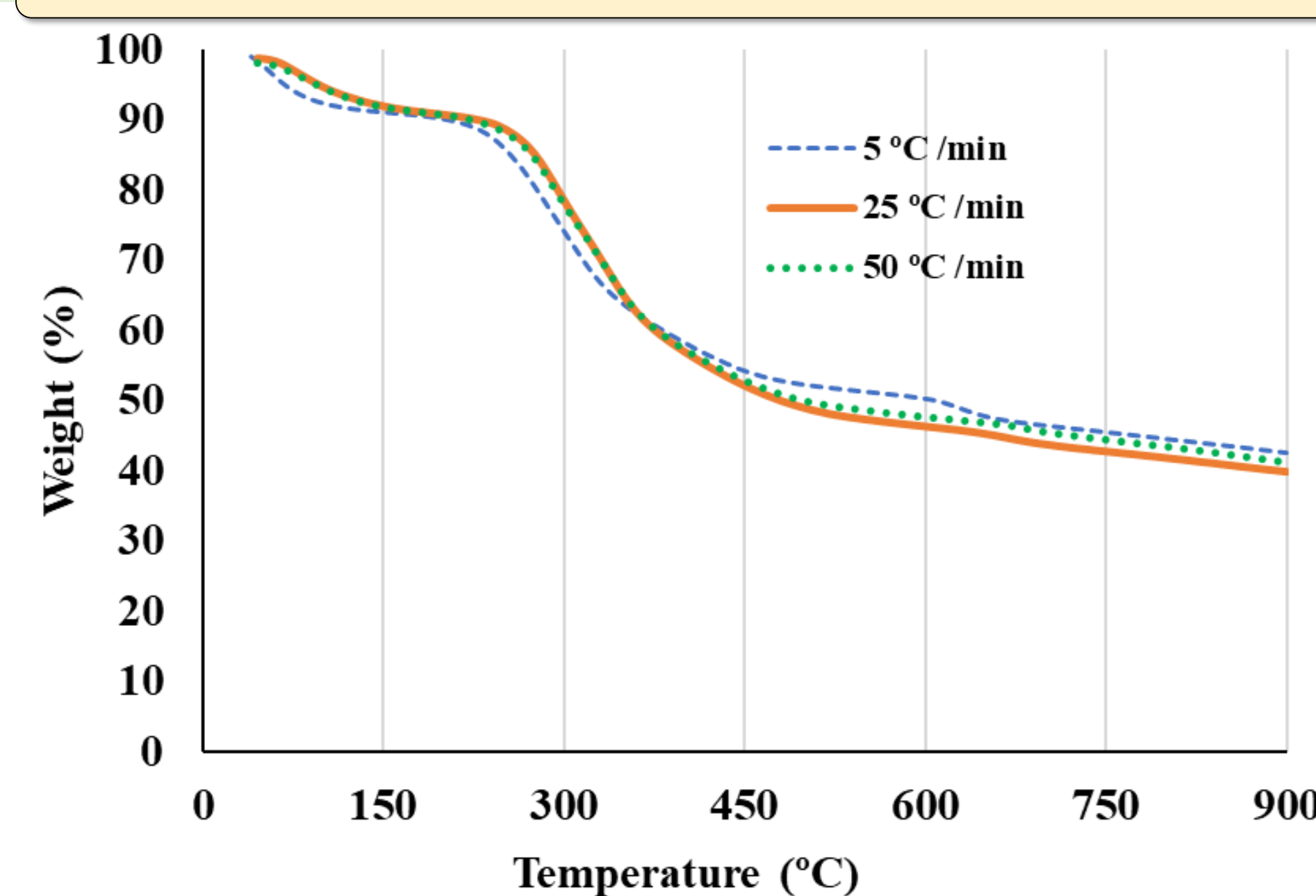
450 °C, 500 °C, 600 °C, 750 °C

GAS

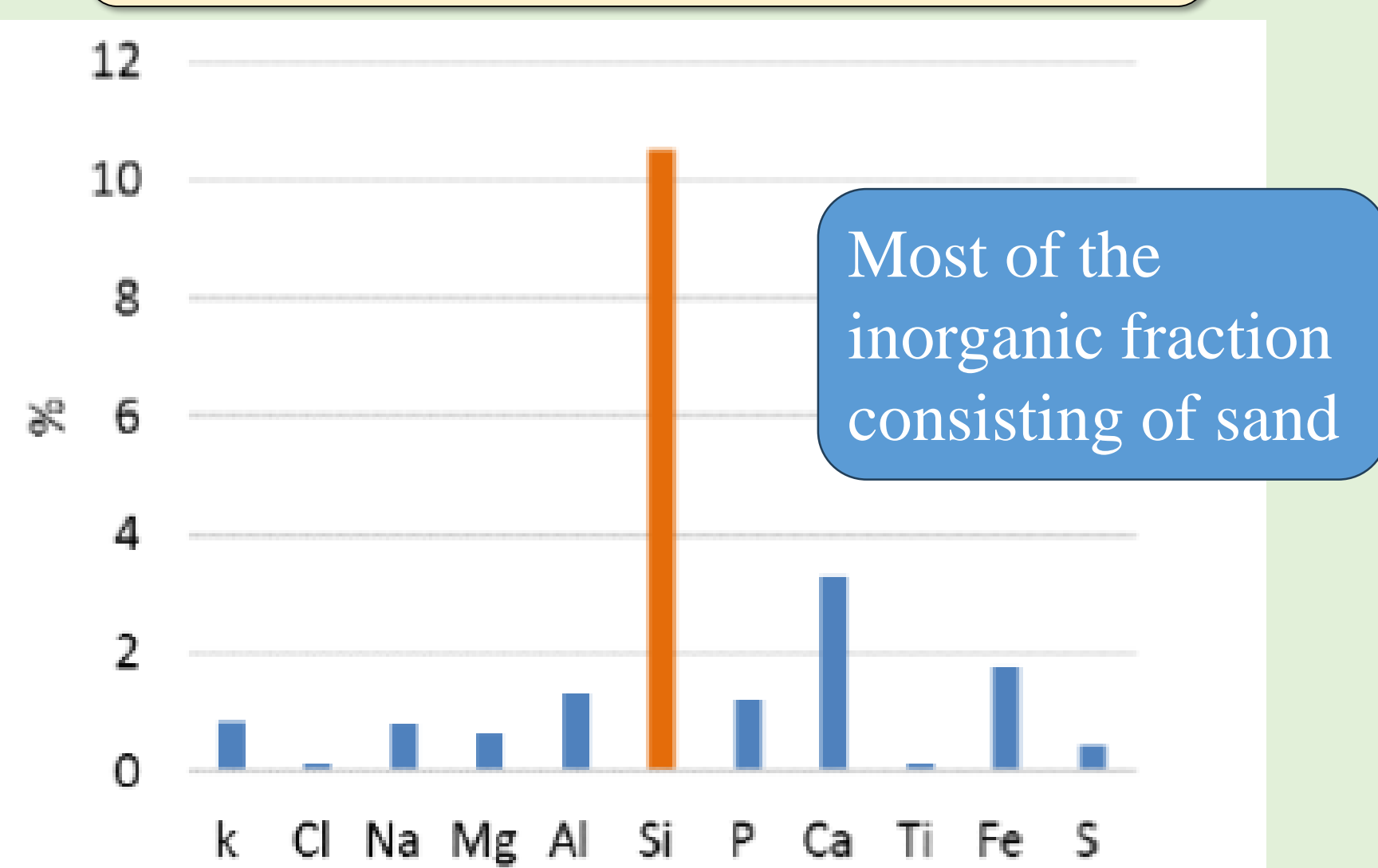
BIO-OIL

BIO-CHAR

TGA ANALYSIS OF MACROALGAE SLUDGE

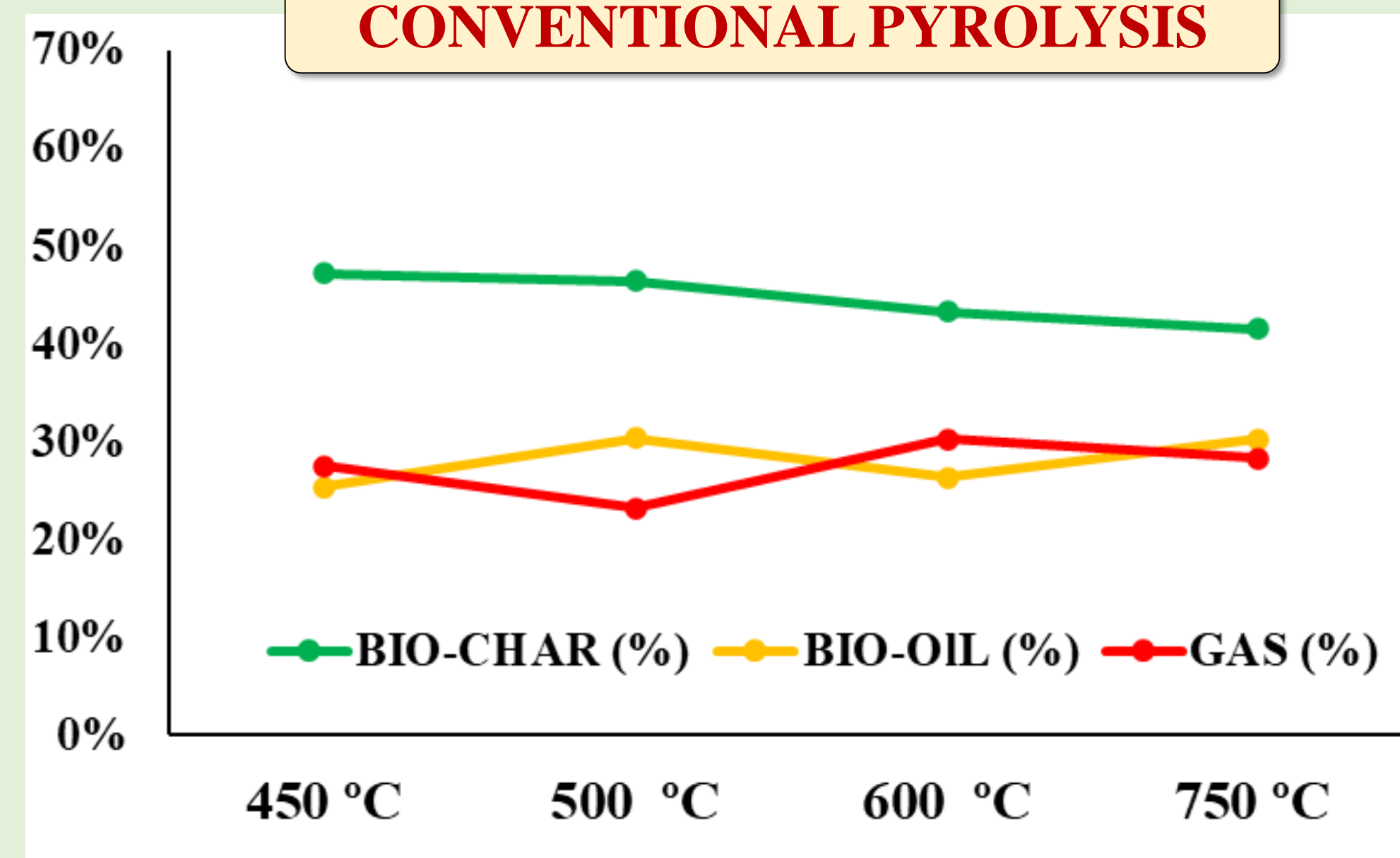


INORGANIC FRACTION OF MACROALGAE SLUDGE

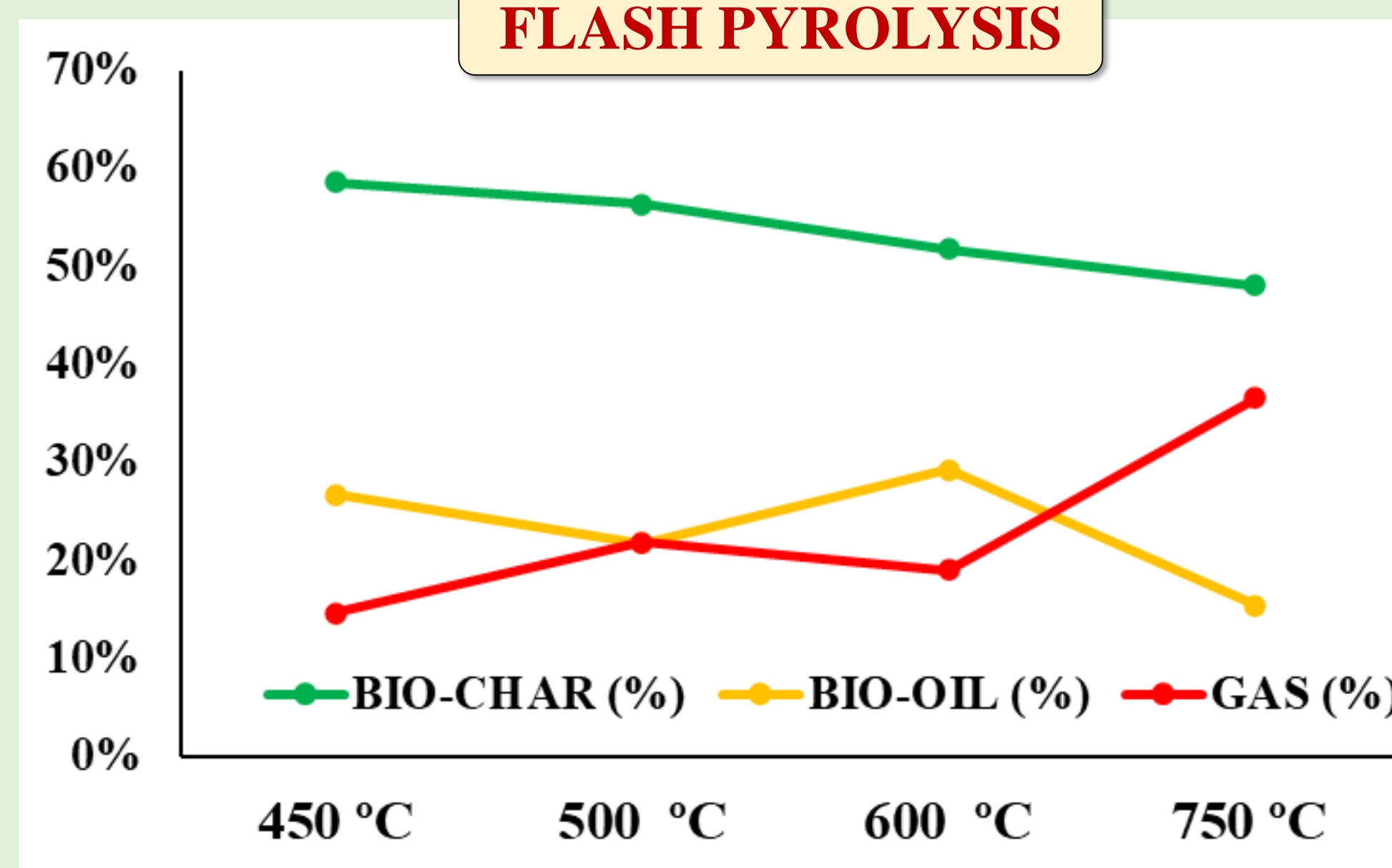


PYROLYSIS YIELDS

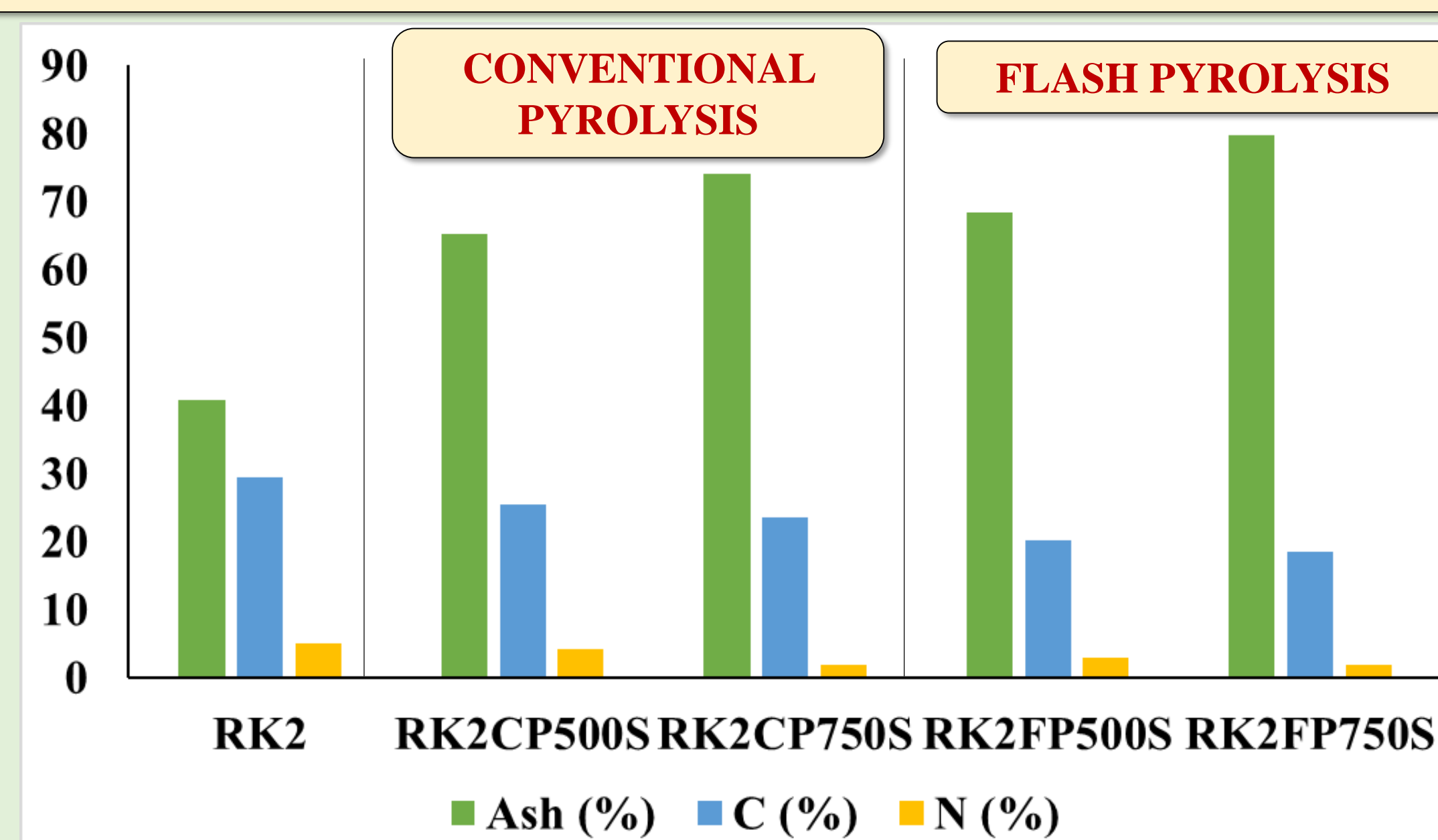
CONVENTIONAL PYROLYSIS



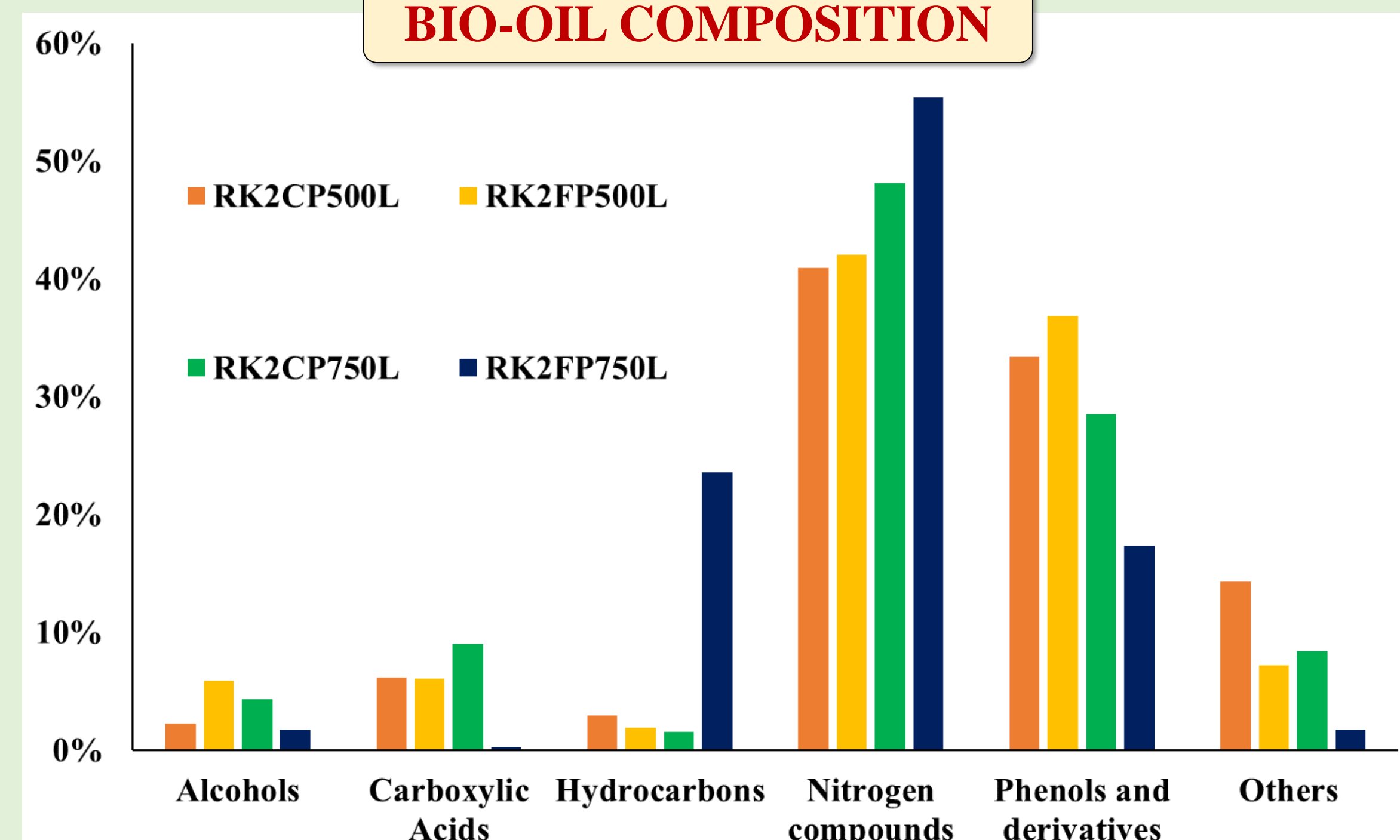
FLASH PYROLYSIS



CHEMICAL CHARACTERIZATION OF RK2 AND BIOCHARS



BIO-OIL COMPOSITION



CONCLUSIONS

- ❖ Macroalgae sludge proves to be a promising feedstock for thermochemical conversion despite its high ash content, highlighting its potential in sustainable waste-to-energy applications.
- ❖ Temperature and heating rate strongly influence pyrolysis product yields.
- ❖ The resulting products show valuable properties: biochar for environmental and agricultural uses, bio-oil as an energy-rich liquid, and gas for efficient energy recovery.

Acknowledgements: