# Valorization of microalgae biomass by co-combustion with coal: a thermogravimetric assesment

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**1. Introduction –** Microalgae are known to be promising candidates for $CO_2$ sequestration [1]. However, the implementation of such sequestration is rather constrained by economic limitations. In order to overcome these limitations, the culture of microalgae in wastewater, which is used as a source of nutrients, is a way to reduce associated costs while allowing microalgae-based wastewater treatment [2]. However, residual biomass is generated during microalgae culture and, for a sustainability matter, a use should be given to this biomass. Thermal utilization of microalgae biomass is a menas to closing the loop and increasing the sustainability of microalgae culture and wastewater treatment (Kassim et al., 2017). From a practical point of view, the co-combustion of a small percentage (10% wt.) of microalgae biomass with coal in existing infrastructures may be interesting. In order to assess the feasibility of such an option, this work aims to assess the behaviour of microalgae biomass during combustion and during co-combustion with coal.

**2. Experimental –** Thermogravimetric analysis (TGA), differential thermogravimetry (DTG) and differential scanning calorimetric (DSC) were used for the characterization of thermal behaviour of microalgae biomass, coal and their blends. Temperature programmed combustions were carried out at different heating rates ($\beta$ = 0.1, 0.2, 0.4 and 0.5 K/s) under continuous air flow (100 $cm^3$/min at 1 atm). Results were analyzed for interactions between coal and microalgae biomass and the Flynn-Wall-Ozawa non-isothermal kinetic model was used to determine the combustion apparent activation energies.

**3. Results and Discussion** – TGA, DTG and DSC showed large differences between the combustion of microalgae biomass and coal, allowing to verify the absence of interactions during their co-combustion.

**Table I.** Combustion activation energy (E).

| Fuel | E (kJ/mol) |
|---|---|
| coal | 89 |
| microalgae biomass | 197 |
| blend | 103 |

On the other hand, as may be seen in Table I, the apparent activation energies corresponding to the combustion of coal and its blend with microalgae biomass were quite close. Furthermore, the combustion of the blend was very similar to that of coal in terms of weight loss and heat release.

**4. Conclusions -** Under the here used conditions, namely a 10% wt. blending of microalgae biomass with coal, obtained results pointed to the feasibility of their co-combustion. Such co-combustion would allow for the thermal valorization of microalgae biomass resulting from microalgae culture and wastewater treatment, so improving their economic perspectives.

**5. References**

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