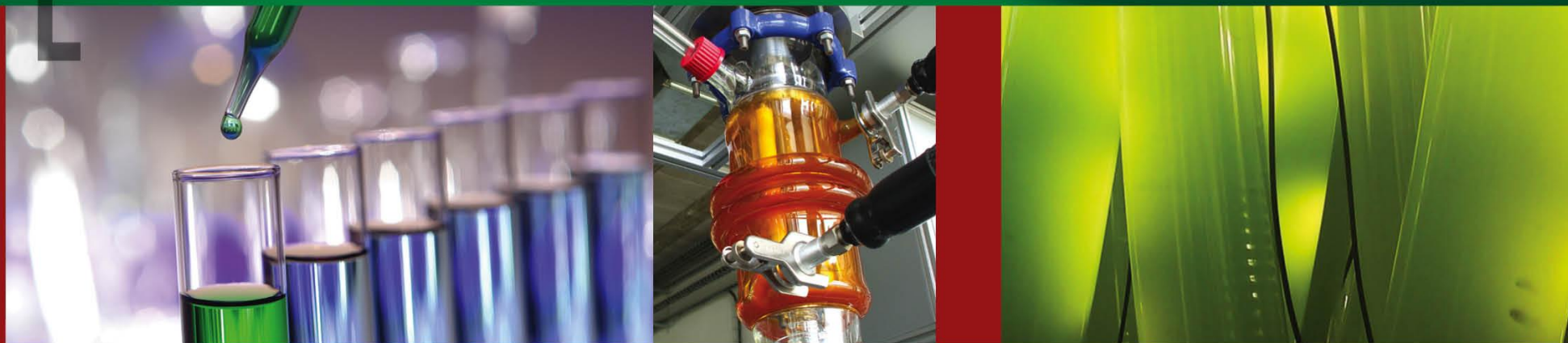


## InnoVenton: NMMU Institute for Chemical Technology and Downstream Chemicals Technology Station



### Reduction of greenhouse gas emissions through co-firing of coal and microalgae biomass

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#### 1. Introduction and objectives

Coal is a complex material formed millions of years ago by partial decomposition and coalification of very old plants under high pressure at high temperature. It is made up of organic matters, mineral matter and moisture. Coal production and use are non environmentally friendly. There is therefore a need to devise new ways to reduce greenhouse gas effect. The objective of this study is to determine the properties of coal, algae and the coalgae<sup>(TM)</sup> agglomerates as well as their thermal behaviour.

#### 2. Experimental



(a)

-Volatile(ASTM D3175)  
-Ash (ASTM E1755)



(b)

-Moisture: ASTM E871  
-Fixed carbon : ASTM E870



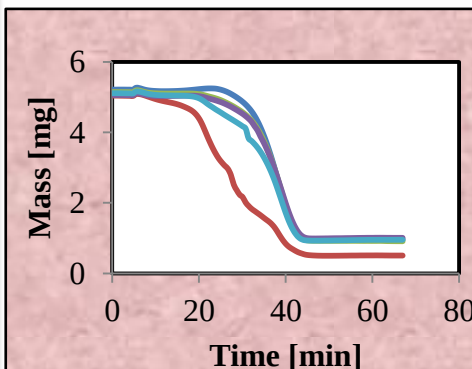
-Sample mass: 5mg  
-Flow rate: 20ml/min  
-Temp: 800°C  
-Heating rate: 10°C/min

Figure 1 (a) Furnace (b) Oven (c) TG

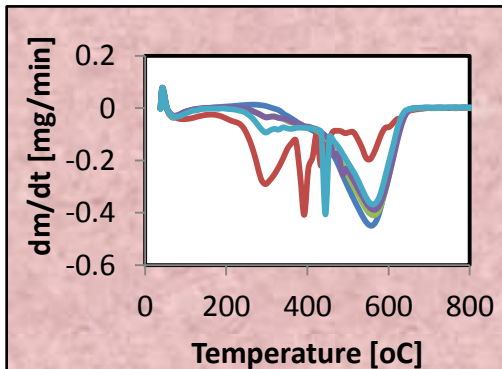
#### 3. Results

Table 1: Proximate analysis of coal, algae and coalgae agglomerates

| Proximate analysis | Coal    | Coalgae (90:10) | Coalgae (80:20) | Coalgae (70:30) | Algae   |
|--------------------|---------|-----------------|-----------------|-----------------|---------|
| VM (%)             | 23.1099 | 28.1598         | 33.2295         | 38.5356         | 77.3405 |
| M (%)              | 4.7775  | 4.6100          | 4.6380          | 6.1075          | 5.4775  |
| FC (%)             | 57.9233 | 54.8004         | 50.7914         | 44.9230         | 11.5862 |
| Ash (%)            | 14.1893 | 12.4298         | 11.3411         | 10.4339         | 5.5958  |



(a)



(b)

Figure 2 (a) TG and (b) DTG profiles for coal, algae and coalgae agglomerates  
(— coal — algae — coalgae 90:10 — coalgae 80:20 — coalgae 70:30)

#### 4. Conclusion

Co-firing coal with microalgae biomass will reduce the emissions level due to low fixed carbon and ash content of algae. A synergetic effect was observed in the co-combustion of coalgae using TG.

#### Acknowledgement

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