EFFECT OF BIOMASS COMBUSTION ON PARTICULATE MATTER, CARBONACEOUS PARTICLES AND PAH CONCENTRATION LEVELS

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Biomass pellets have gained a huge acceptance as an environmentally friendly fuel, during the last twenty years worldwide. Biomass combustion, however, is a source of emissions of particulate matter (PM). The emissions depend crucially on combustion technology, combustor type and operation parameters like fuel load, airflow setting and fuel itself [1].

The main objective of the present study was to investigate the PM$_{10}$ emissions from the combustion of specific types of wood pellets that are found in the trade in Greece and are used the last years for domestic heating. The combustion took place in a tube furnace, found the appropriate conditions by thermogravimetric analysis (TG) [2]. The gases evolved from the furnace were cooled and led to a filter holder system, containing a quartz filter retained all particles from < 10µm to 0,3µm. In order to boost particle retention on the filter and have isokinetic sampling, a dual stage vacuum pump employed at a flow rate of 5.4m$^3$/h was attached to the filter holder. According to the standard ΕΛΟΤ ΕΝ 303.05 it was examined the emissions of particles (PM$_{10}$) of each type of pellet. The three types of carbon (total organic carbon, elemental and inorganic carbon) were determined with thermal analytical techniques. Furthermore, a series of polycyclic aromatic hydrocarbons (PAHs) was examined with a suitable method of extraction of filters by gas chromatography-mass spectrometry (GC-MS). It results that some types of pellets exceed the maximum limits of permitted emissions of particles according to the standard ΕΛΟΤ EN 303.05. The organic carbon was quite different between the types of pellets [3]. Dangerous PAHs were detected too. Utilizing high quality wood pellets is the primary consideration in order to assure limited particulate emissions of PM$_{10}$. After these simulation experiments, real conditions combustions in pellet stoves with wood pellets will follow.

KEYWORDS: Wood pellets, combustion, PM$_{10}$–emissions, TG, total organic carbon, PAHs

REFERENCES: