

Pollution Associated with Combustion in Stove to Firewood (Eucalyptus) and Pellet (Radiata Pine): Effect of UVA Irradiation

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Abstract : In several cities in Chile, there is significant urban pollution, particularly in Santiago and in cities in the south where biomass is used as fuel in heating and cooking in a large proportion of homes. This has generated interest in knowing what factors can be modulated to control the level of pollution. In this project was conditioned and set up a photochemical chamber (14m³) equipped with gas monitors e.g. CO, NOX, O₃, others and PM monitors e.g. dustrack, DMPS, Harvard impactors, etc. This volume could be exposed to UVA lamps, producing a spectrum similar to that generated by the sun. In this chamber, PM and gas emissions associated with biomass burning were studied in the presence and absence of radiation. From the comparative analysis of wood stove (eucalyptus globulus) and pellet (radiata pine), it can be concluded that, in the first approximation, 9-nitroanthracene, 4-nitropyrene, levoglucosan, water soluble potassium and CO present characteristics of the tracers. However, some of them show properties that interfere with this possibility. For example, levoglucosan is decomposed by radiation. The 9-nitroanthracene, 4-nitropyrene are emitted and formed under radiation. The 9-nitroanthracene has a vapor pressure that involves a partition involving the gas phase and particulate matter. From this analysis, it can be concluded that K⁺ is compound that meets the properties known to be tracer. The PM_{2.5} emission measured in the automatic pellet stove that was used in this thesis project was two orders of magnitude smaller than that registered by the manual wood stove. This has led to encouraging the use of pellet stoves in indoor heating, particularly in south-central Chile. However, it should be considered, while the use of pellet is not without problems, due to pellet stove generate high concentrations of Nitro-HAP's (secondary organic contaminants). In particular, 4-nitropyrene, compound of high toxicity, also primary and secondary particulate matter, associated with pellet burning produce a decrease in the size distribution of the PM, which leads to a depth penetration of the particles and their toxic components in the respiratory system.

Keywords : biomass burning, photochemical chamber, particulate matter, tracers

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